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Analysis of Coal Samples from Licking River District, Kentucky (Elliott, Magoffin, Morgan, and Wolfe Counties and Parts of Menifee, Powell, and Rowan Counties)

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KENTUCKY GEOLOGICAL SURVEY
UNIVERSITY OF KENTUCKY, LEXINGTON
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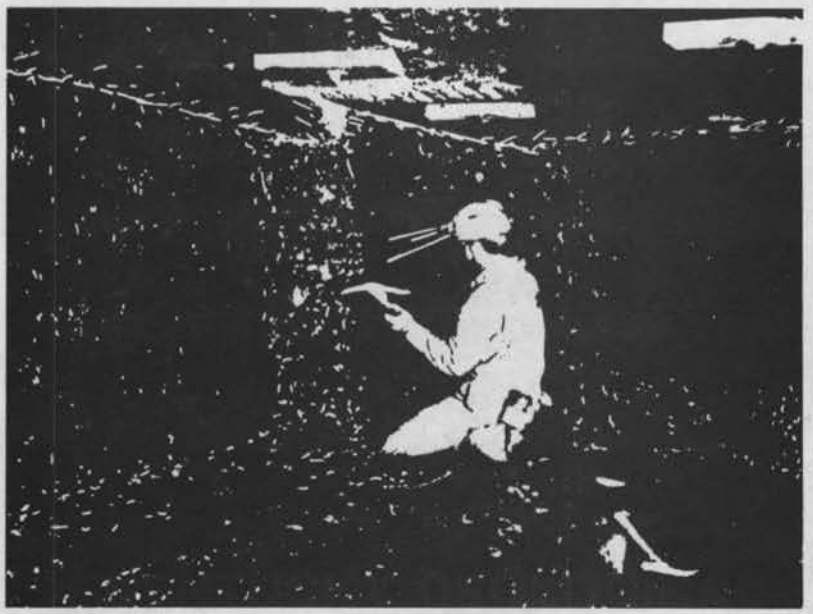
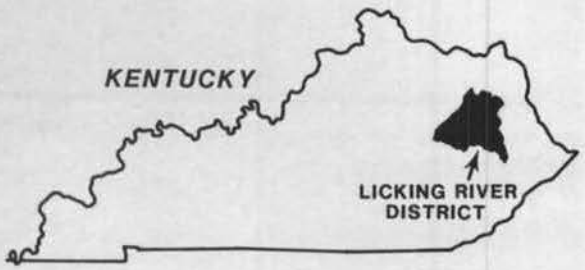
State Geologist and Director

ANALYSIS OF COAL SAMPLES FROM THE LICKING RIVER DISTRICT, KENTUCKY

Elliott, Magoffin, Morgan, and Wolfe Counties, and Parts of Menifee, Powell, and Rowan Counties





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James C. Currens[1], Linda Jean Bragg[2], and James C. Hower[3]

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ANALYSIS OF COAL SAMPLES FROM THE LICKING RIVER DISTRICT, KENTUCKY (Elliott, Magoffin, Morgan, and Wolfe Counties and Parts of Menifee, Powell, and Rowan Counties)

James C. Currens[1], Linda Jean Bragg[2], and James C. Hower[3]

ABSTRACT

Chemical and petrographic data are presented for 41 samples of coal collected in the Licking River District, eastern Kentucky. These data include sample-site locations, sampling conditions, stratigraphic position, megascopic description of the coal, air-drying loss, proximate and ultimate analyses, Btu content, forms of sulfur, initial deformation temperature, softening temperature, fluid temperature, free-swelling index, concentration of major- and minor-oxides and trace elements, and petrographic analyses.

INTRODUCTION

The Eastern Kentucky Coal Field has been subdivided into six reserve districts to facilitate the tabulation of coal-resource estimates. These districts are the Princess, Big Sandy, Licking River, Southwestern, Hazard, and Upper Cumberland. This report on the Licking River District (Fig. 1) is one in a series of coal-quality publications planned for each of the districts. This report provides easily accessible geological and analytical data describing the quality of coals in the Licking River District, which includes Elliott, Magoffin, Morgan, and Wolfe Counties, and parts of Menifee, Powell, and Rowan Counties.

Forty-one samples of coal were collected for chemical and petrographic analyses. Field-sampling data, proximate and ultimate analyses, Btu content, forms of sulfur, free-swelling index, determinations of major- and minor-oxides and trace elements, and petrographic analyses are contained in this report.

Brant (1982, 1983) and Brant and others (1983a-d) estimated the coal resources for each of the six districts in the Eastern Kentucky Coal Field. Brant and others (1983a) reported that 26 coal beds (Fig. 2) in the Licking River District originally contained 3.59 billion tons of coal. Isopach maps (Brant and others, 1983a) are published for the Lower Broas, Upper Peach Orchard, Lower Peach Orchard, Lower Hazard, Fire Clay (bed "A"), Cannel City (bed "A"), and Little Caney (bed "B") coal beds. When used together, these coal-resource and coal-quality reports provide the essential tools for integrating the quantity and quality of eastern Kentucky coals on a regional basis.

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METHODS

Although this report contains only the results for samples collected in the Licking River District, the methods of sampling were developed to determine coal quality for the entire Eastern Kentucky Coal Field. The choice of sampling sites and field techniques was largely determined by the logistical constraints associated with the collection of more than 600 coal samples distributed over a stratigraphic section containing more than 30 major coal zones and an area including all or parts of 38 eastern Kentucky counties. Therefore, expediency, uniform areal and stratigraphic distribution of sample sites, consistent sampling technique, and thorough sample documentation were major considerations in sample collection.

Sample Sites

The selection of sample sites was influenced by many factors. First, maintaining a consistent distribution of samples over a coal bed area, regardless of coal thickness, was important to delineate the regional characteristics of the coal beds. However, exposures of coal beds of mineable thickness were selected where possible to make the data economically relevant. Second, sites were chosen where many coal beds were exposed and easily accessible so that changes in coal-quality characteristics from one coal bed to another could be identified. Therefore, many of the samples are either from roadcuts along major highways that were under construction at the time of sampling or from surface mines. Third, thin coal beds were sampled in areas where they might be mineable by themselves or in conjunction with overlying or underlying beds, or in areas of widespread coal occurrence.

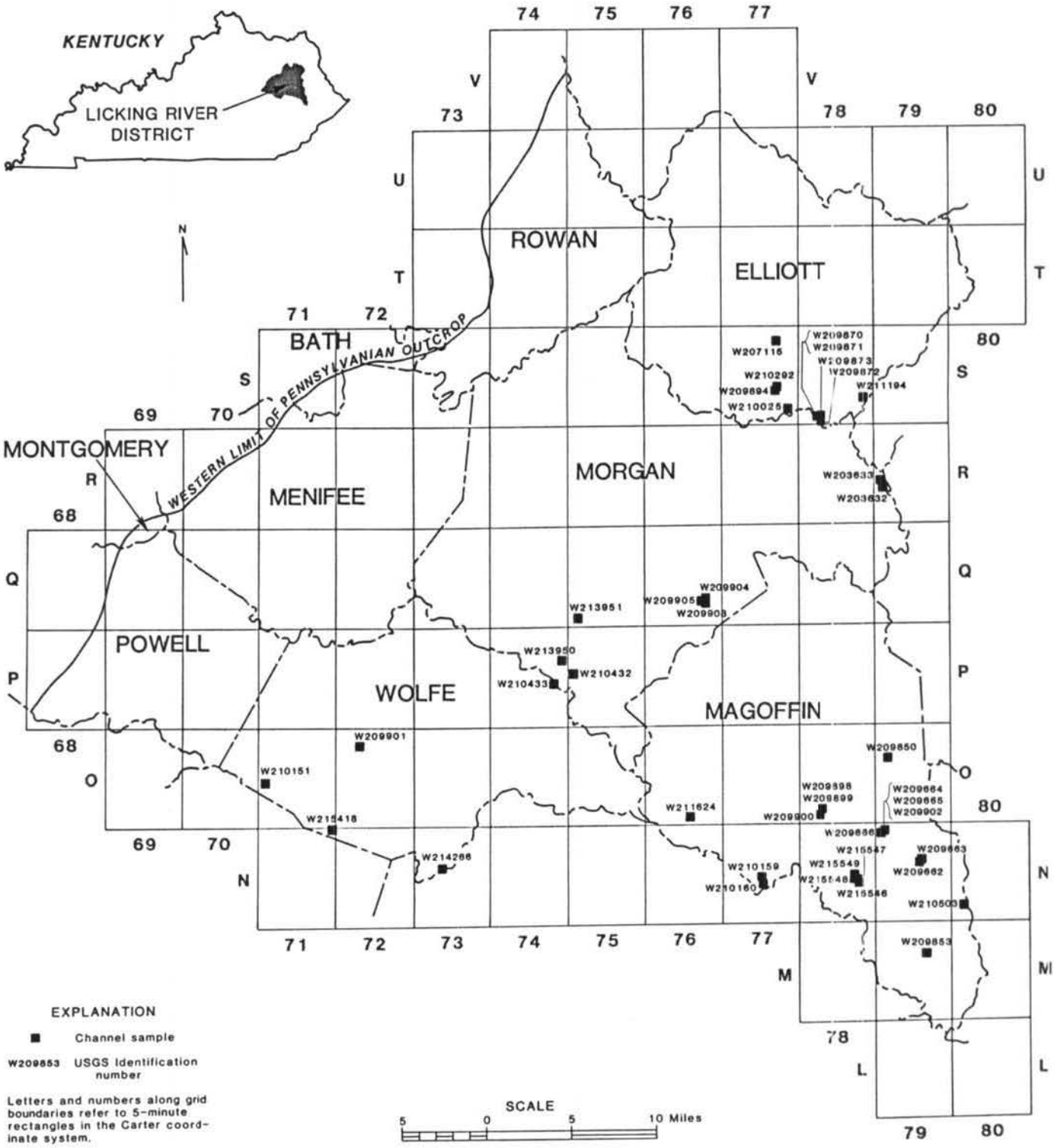
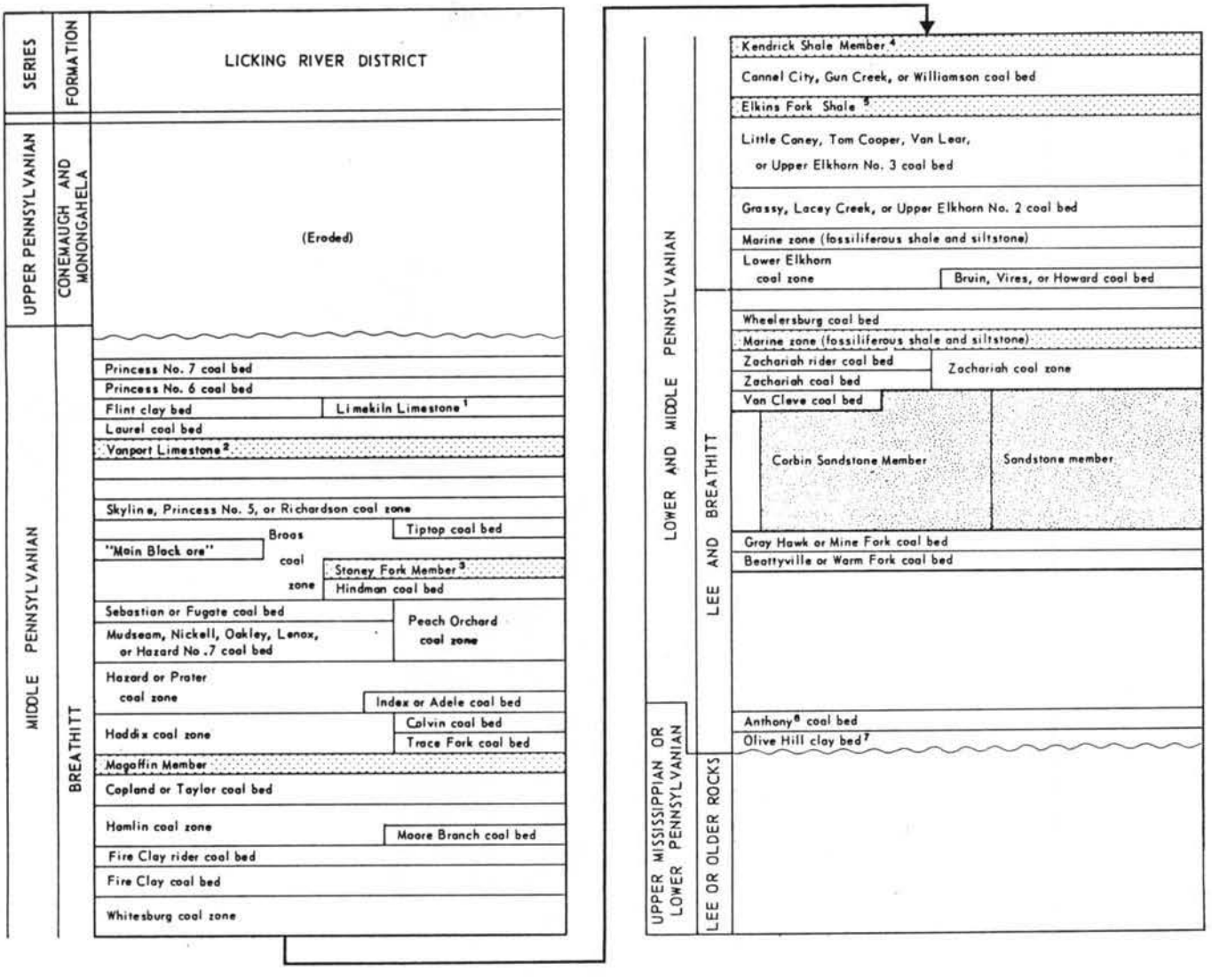


Figure 1. Locations of coal-sampling sites in the Licking River District.

The freshness of the exposed coal was also a major consideration in the choice of sample sites. In general, a coal outcrop was not sampled if it had been exposed for more than 6 weeks. Exceptions were made if other opportunities to sample the coal bed were unlikely. The freshness of the exposures along highway construction projects ranged from a few months to several hours. Samples from surface mines and prospect openings were generally fresh, but a few samples were taken in areas where deeply weathered coal beds were being mined. Underground mines generally provided the freshest samples, but because of the time and effort needed to travel to the working face, above-ground exposures were used where available. Nevertheless, more than 100



[1] Of local usage (Johnston, 1962)

[2] As used by Phalen (1912)

[3] Formerly Lost Creek Limestone of Morse (1931)

[4] Formerly Kendrick Shale of Jillson (1920)

[5] Of Morse (1931)

[6] Name used for coal bed in adjacent areas

[7] Of Crider (1913)

Figure 2. Key stratigraphic units in the Licking River District.

underground mines were sampled in eastern Kentucky. A few core samples were obtained for analysis; these samples were normally in excellent condition.

Elevations of sample sites were determined by several methods. A barometric altimeter was used for many determinations, and all two-way traverses from benchmark to sample site were adjusted for temperature changes and pressure fluctuations. Wherever possible, local leveling surveys were used to determine elevation. Underground elevations were typically determined from mine maps. Hand-leveling was used extensively to tie sample sites to benchmarks and to measure elevation differences between coal beds at surface mines and roadcuts. Topographic maps were used to estimate elevations in remote areas where other methods were not feasible.

Sampling Methods

Two sampling regimes were used. During the first 6 months of collection the guidelines of Swanson and Huffman (1976) were followed, and partings less than 10 cm (4 in.) thick were included in the sample (Fig. 3). The

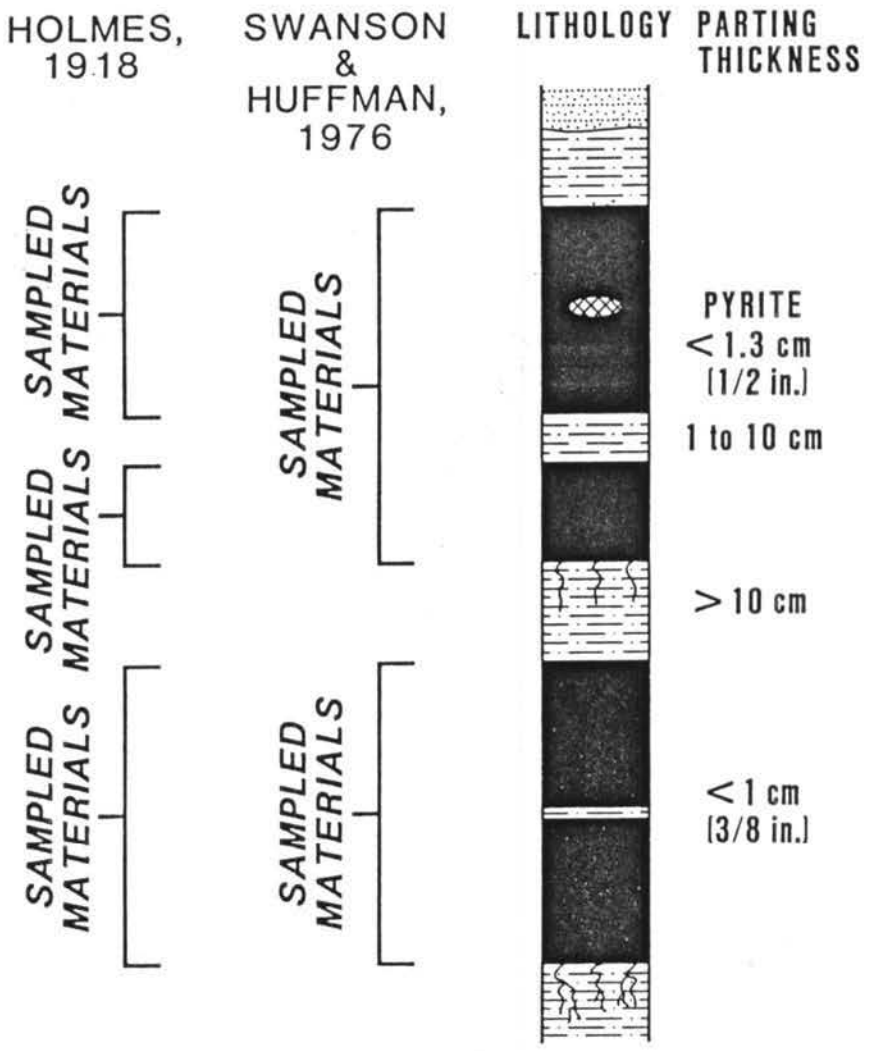


Figure 3. Diagrammatic column showing different criteria for excluding partings in the sampling methods of Holmes (1918) and Swanson and Huffman (1976).

method of Holmes (1918) was adopted after the first field season and was used for the majority of the samples. The Holmes method is the standard method of the American Society for Testing and Materials (ASTM) for collecting channel samples for the determination of rank (ASTM, 1981). Under the Holmes method, all partings greater than 1 cm (3/8 in.) are excluded from the sample. The sampling regime is recorded in the Sampling Report (Appendix I). The guidelines for the exclusion of partings of either regime were exceeded at some exposures to make the samples conform to local mining practice. These samples are described in Appendix I as having "thick partings included." The same guidelines were also applied to core samples. The sampling guidelines for several samples collected before June 1979 are unknown and are so noted.

Dimensions of channel cuts were commonly adjusted to the thickness of the coal bed. The channels were typically 4 to 6 inches square (10 to 15 cm), and none was less than 3 inches (8 cm) square. In thick coal beds these channel cuts produced a large volume of sample, which was split in the field by coning and quartering. However, after the first 2 years of the sampling program, field splitting was discontinued. All of the core samples were 2.25 inches (6.4 cm) in diameter.

Megascopic Description

The descriptive methods of Schopf (1960) were chosen as a basis for the megascopic descriptions, but modifications were made in the terminology. Semiquantitative terms were chosen to reflect the thickness and abundance ranges defined by Schopf. The terms "bright attrital," "dull attrital," and "nonbanded" were replaced by "clarain," "durain," and "canneloid," respectively. Additional concentration categories were used; "scattered" was defined as 5 to 15 percent, and "sparse" was redefined as less than 5 percent. "Dominant" was changed to "very abundant," and "moderate" was

changed to "common." The total seam thickness was measured and recorded separately from the megascopic description.

Sample Preparation

Samples with field-identification numbers higher than 063 were delivered to the University of Kentucky Institute for Mining and Minerals Research (IMMR) at the Kentucky Center for Energy Research Laboratory for drying, crushing, splitting, and repackaging. The samples were air-dried and crushed to 0.5-inch (1.3 cm) maximum size before splitting to minimize the possibility of contamination. Generally, three splits of each sample were prepared; 50 percent went to the U.S. Geological Survey (USGS), 25 percent went to IMMR for petrographic and other analyses, and the remainder is stored at the Kentucky Geological Survey's (KGS) Well Sample and Core Library. Small samples were not split. The 0.5-inch (1.3 cm) samples were crushed to 0.1 inch (0.3 cm) by the USGS. The split for chemical analysis was crushed to 0.08 inch (0.177 mm). The pulverizer used for this crushing was equipped with ceramic plates to minimize contamination.

PRESENTATION OF DATA

Field Notes and Laboratory Analyses

The coal-sampling reports (field notes) and the coal-analysis reports (laboratory analyses) for each sample are presented on facing pages in Appendix I. The field notes and analyses are arranged in numerical order by the USGS identification number. Most of the information in the field notes is self explanatory, but a few items need clarification. For example, the date on the sampling report is the day the sample was collected. However, samples KGS 001 through KGS 041, which were collected before the USGS/KGS cooperative sampling program began, have a sampling date of January 1, 1978, to indicate that the sample was collected sometime during that year. All thickness measurements except total seam thickness have been converted from meters to feet. The section in each sampling report on structural features applies primarily to cleat azimuths, which were measured for most exposures. Structural features other than jointing (cleat) were seldom encountered during the sampling program. The dips of cleat surfaces were recorded if they were measurably different from vertical; these data are available from the Kentucky Geological Survey. The "IN SAMPLE?" column indicates which units were included in the sample.

The laboratory analyses were performed by the U.S. Bureau of Mines (USBM) and Geochemical Testing, Inc. (Geo Test). The as-received values are shown as reported by the laboratory. The moisture-free and moisture- and ash-free values have been recalculated using standard formulas (ASTM, 1981) (ASTM D-3180-74). Other calculated values not shown on these analysis reports, such as volume-percent mineral matter and moist, mineral-matter-free Btu, are available from KGS. Specific gravity, Hardgrove grindability, washability, and similar tests were not performed. Most of the laboratory analyses were completed within 3 months after the samples were received by USGS. However, many of the samples from the Licking River District were stored for as long as a year, and these samples may have undergone some oxidation.

Table 1 of Appendix II shows the location, rank, and thickness of coal samples collected from the Licking River District. The apparent rank of each sample was calculated by using data in the coal-analysis reports (Appendix I) and the Parr formulas (ASTM, 1981) (ASTM D-388-77). Apparent ranks for these samples are high-volatile B bituminous or high-volatile A bituminous coal, except for W209873 (KGS 302) and W210151 (KGS 325). These samples have an apparent rank of high-volatile C bituminous, which is erroneous because of the weathered condition of the samples.

Chemical Analyses

Major- and minor-oxide and trace-element concentrations are reported for 41 coal samples from the Licking River District. Table 2 (Appendix II) presents the results of analyses (in weight percent) performed on coal ash, and Table 3 (Appendix II) contains the results of analyses for 23 trace elements (in parts per million) in the whole coal. Table 4 (Appendix II) summarizes the results for all of the chemical species on a whole coal basis. A total of 65 elements was searched for, and the following 11 elements were not found: Au, In, Ir, Os, Pd, Pt, Re, Rh, Ru, Te, and Tm. The whole-coal determinations were performed on air-dried coal (32°C) by wet chemical analysis, atomic absorption spectroscopy, X-ray fluorescence spectroscopy, and instrumental neutron activation analysis. The chemical composition of the ash (from coal ashed at 525°C) was determined by wet chemical analysis, X-ray fluorescence, and optical emission spectroscopy.

Figure 4 is a flow diagram that illustrates the various stages of preparation and analysis involved in processing coal samples. Analyses were performed by the USGS Branch of Analytical Chemistry. Analytical procedures used by the USGS were described by Swanson and Huffman (1976).

Petrographic Analyses

Petrographic analyses were performed at the Kentucky Center for Energy Research Laboratory. This laboratory is equipped with four Leitz petrographic microscopes, including one MPV-II and two MPV-Compact photometer

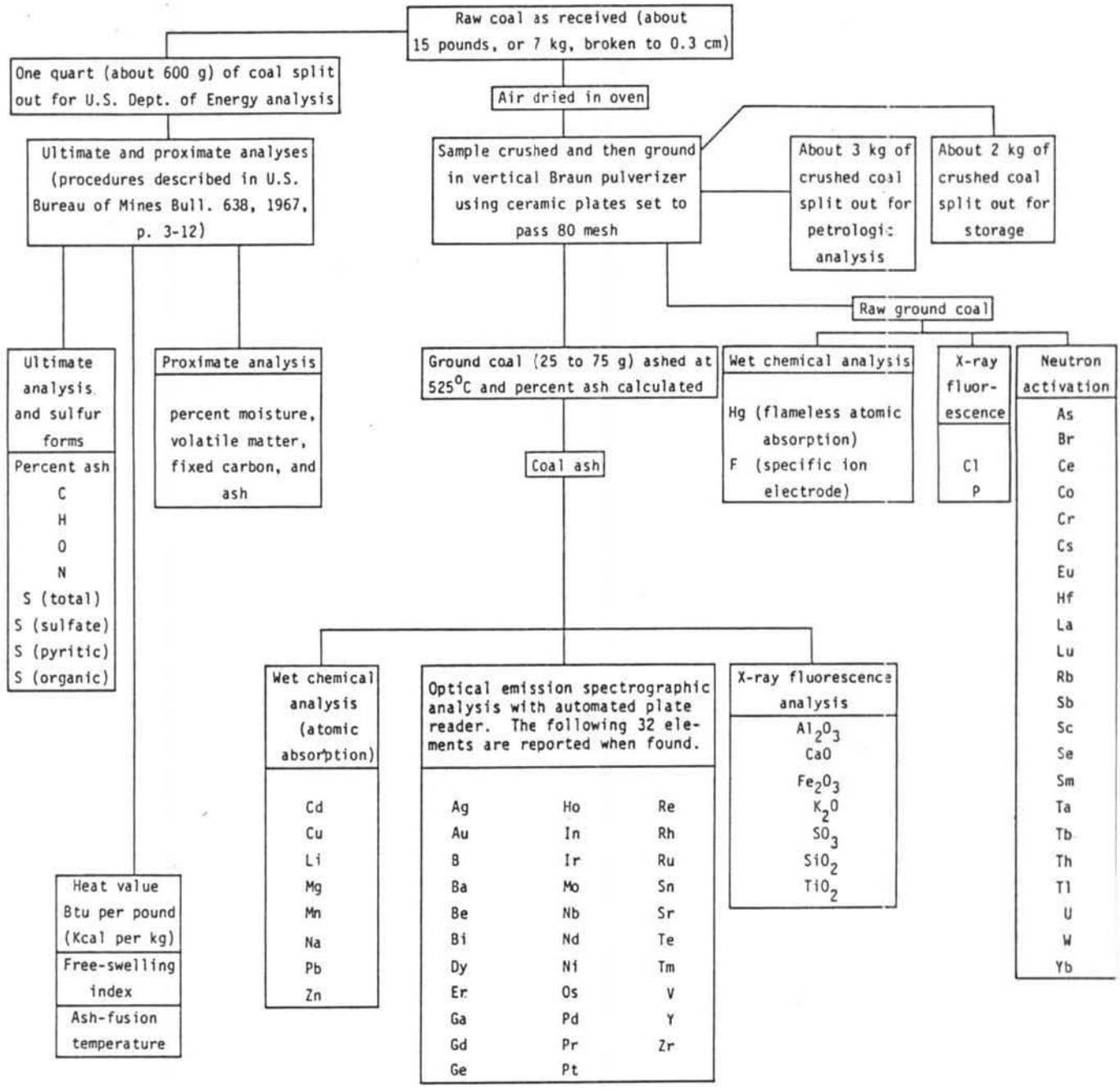


Figure 4. Flow diagram illustrating procedures used for coal-sample analysis.

systems for the determination of vitrinite maximum reflectance. Preparation and examination of the samples followed ASTM (1981) standards D-2797-72 (preparation), D-2796-81 and D-2799-72 (maceral analysis), and D-2798-79 (vitrinite reflectance). Results of the petrographic analyses are shown in Appendix III.

ACKNOWLEDGMENTS

The field work, classification, and major- and minor-oxide and trace-element analyses were supported through grants from the USGS (U.S. Department of Interior, 14-08-0001-G 602 and 14-08-0001-A 0077). The support of the USGS, particularly the staff of the Branch of Coal Resources, is gratefully acknowledged. The assistance of Peter Zubovic during the early phase of the program is especially appreciated. Funding for petrographic analyses was provided by the Kentucky Energy Cabinet.

Collection of the coal samples would have been vastly more expensive and time consuming if it were not for the generous cooperation of the several hundred coal companies that allowed sampling in their mines. These companies are too numerous to acknowledge individually, but the authors extend sincere thanks to all of them.

Many individuals and agencies that were not directly involved in the research provided support for the program. The University of Kentucky IMMR provided sample preparation, proximate analyses, petrographic analyses, and an assistant during part of the project in exchange for splits of the coal samples. The authors also thank the personnel of the Kentucky Department of Mines and Minerals and the Department of Transportation for their help in locating prospective sample sites.

Finally, the entire staff of the Kentucky Geological Survey has been very supportive. Special thanks are due to Dr. James C. Cobb and Russell Brant for their helpful suggestions and to Kim R. Blackburn, Elizabeth K. Estes, and Douglas Hayes, student assistants, who contributed significantly both in the field and in the office.

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APPENDIX I:
COAL SAMPLING AND CLASSICAL ANALYSIS REPORTS

COAL SAMPLING REPORT

LABORATORY NO: K89308 FIELD NO: KGS 006 U.S.G.S. NO: W203632
SAMPLER: Casper AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Redbush COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 16 ROW R TIER 79 900 FT FSL, 4350 FT FEL
LATITUDE: 37 DEG 56 MIN 9 SEC LONGITUDE: 82 DEG 59 MIN 54 SEC
ELEVATION (FT): 860.00, OF POINT AT base of 006, USING topo
COMMENTARY:
REGIONAL COAL NAME: U Elkhorn No.3 GEO. MAP COAL NAME: Van Lear
REPORTED COAL NAME: Van Lear FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: unknown
RECOVERY METHOD: channel SAMPLING REGIME: unknown
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 27.2, SAMPLE 27.2, COAL ONLY 27.2
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	11.15	Siltstone.
Y	2.26	Coal.
N		Clay, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: K89308 FIELD NO: KGS 006 U.S.G.S. NO: W203632
LABORATORY: USBM REPORT DATE: Feb/13/1979

AIR DRIED LOSS: 2.10%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.70%		
VOLATILE MATTER	41.50%	43.09%	45.31%
FIXED CARBON	50.10%	52.02%	54.69%
ASH	4.70%	4.88%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.70%	5.49%	5.77%
CARBON	74.10%	76.95%	80.89%
NITROGEN	1.50%	1.56%	1.64%
TOTAL SULFUR	3.20%	3.32%	3.49%
OXYGEN	10.80%	7.80%	8.21%
ASH	4.70%	4.88%	
HEATING VALUE (BTU/LB):	13549	14069	14791
SULFUR FORMS:			
SULFATE	0.02%	0.02%	0.02%
PYRITIC	2.10%	2.18%	2.29%
ORGANIC	1.03%	1.07%	1.12%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2020 deg F
SOFTENING TEMP.	2110 deg F
FLUID TEMP.	2210 deg F

FREE SWELLING INDEX	4.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	4.7

COAL SAMPLING REPORT

LABORATORY NO: K89309 FIELD NO: KGS 008 U.S.G.S. NO: W203633
SAMPLER: Casper AGENCY: KGS DATE: Jan/01/1978
7.5' QUAD: Redbush COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 15 ROW R TIER 79 250 FT FSL, 2650 FT FEL
LATITUDE: 37 DEG 57 MIN 2 SEC LONGITUDE: 82 DEG 59 MIN 33 SEC
ELEVATION (FT): 885.00, OF POINT AT base of 008, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: U Elkhorn No.3 GEO. MAP COAL NAME: Van Lear
REPORTED COAL NAME: Van Lear FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: unknown
RECOVERY METHOD: channel SAMPLING REGIME: unknown
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 22.8, SAMPLE 22.8, COAL ONLY 22.8
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	10.50	Shale.
Y	1.90	Coal.
N		Clay, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: K89309 FIELD NO: KGS 008 U.S.G.S. NO: W203633
LABORATORY: USBM REPORT DATE: Feb/15/1979

AIR DRIED LOSS: 4.50%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	6.80%		
VOLATILE MATTER	35.30%	37.88%	38.24%
FIXED CARBON	57.00%	61.16%	61.75%
ASH	0.90%	0.97%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.70%	5.30%	5.35%
CARBON	75.80%	81.33%	82.12%
NITROGEN	1.60%	1.72%	1.73%
TOTAL SULFUR	0.60%	0.64%	0.65%
OXYGEN	15.40%	10.04%	10.15%
ASH	0.90%	0.97%	
HEATING VALUE (BTU/LB):	13291	14261	14400
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.13%	0.14%	0.14%
ORGANIC	0.45%	0.48%	0.49%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2320 deg F
SOFTENING TEMP.	2410 deg F
FLUID TEMP.	2520 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	0.9

COAL SAMPLING REPORT

LABORATORY NO: K96810 FIELD NO: KGS 101 U.S.G.S. NO: W207115
SAMPLER: Kung AGENCY: KGS DATE: Jul/11/1979
7.5' QUAD: Isonville COUNTY: Elliott DISTRICT: Licking River
CARTER COORDINATE: SEC 2 ROW S TIER 77 1750 FT FSL, 2750 FT FEL
LATITUDE: 38 DEG 4 MIN 17 SEC LONGITUDE: 83 DEG 6 MIN 34 SEC
ELEVATION (FT): 1100.00, OF POINT AT base of 101, USING topo
COMMENTARY:
REGIONAL COAL NAME: U Peach Orchard GEO. MAP COAL NAME: Sebastian
REPORTED COAL NAME: Sebastian FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, "outcroppy"
SAMPLE CONDITION: slightly weathered
RECOVERY METHOD: channel SAMPLING REGIME: Swanson & Huffman
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 45.5, SAMPLE 45.5, COAL ONLY 30.9
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	0.98	Coal.
N	19.69	Claystone, medium-gray, wet.
Y	0.56	Vitrain, with clarain, oxidized pyrite.
Y	0.49	Claystone, dark-gray.
Y	0.38	Durain, with abundant interbedded clarain.
Y	0.72	Claystone, dark-gray.
Y	1.64	Durain, with abundant interbedded clarain.
N		Claystone, dark-gray, not rooted.

COAL ANALYSIS REPORT

LABORATORY NO: K96810 FIELD NO: KGS 101 U.S.G.S. NO: W207115
LABORATORY: USBM REPORT DATE: Nov/15/1979

AIR DRIED LOSS: 3.80%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	6.30%		
VOLATILE MATTER	33.80%	36.07%	43.50%
FIXED CARBON	43.90%	46.85%	56.50%
ASH	16.00%	17.08%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.20%	4.80%	5.79%
CARBON	61.20%	65.31%	78.76%
NITROGEN	1.20%	1.28%	1.54%
TOTAL SULFUR	2.40%	2.56%	3.09%
OXYGEN	14.00%	8.97%	10.82%
ASH	16.00%	17.08%	
HEATING VALUE (BTU/LB):	11013	11753	14174
SULFUR FORMS:			
SULFATE	0.03%	0.03%	0.04%
PYRITIC	1.79%	1.91%	2.30%
ORGANIC	0.58%	0.62%	0.75%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2320 deg F
SOFTENING TEMP.	2420 deg F
FLUID TEMP.	2510 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	4.4

COAL SAMPLING REPORT

LABORATORY NO: L04861 FIELD NO: KGS 149 U.S.G.S. NO: W209662
SAMPLER: Currens & Kung AGENCY: KGS DATE: Dec/05/1979
7.5' QUAD: Ivyton COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 13 ROW N TIER 79 5500 FT FSL, 100 FT FEL
LATITUDE: 37 DEG 37 MIN 54 SEC LONGITUDE: 82 DEG 57 MIN 1 SEC
ELEVATION (FT): 1340.00, OF POINT AT base of 149, USING topo
COMMENTARY:
REGIONAL COAL NAME: Broas zone GEO. MAP COAL NAME: Broas
REPORTED COAL NAME: Broas FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: slightly weathered
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 44.3, SAMPLE 44.3, COAL ONLY 44.3
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 310, SET 2 225, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	16.40	Siltstone, medium-gray, arenaceous; carbonaceous near base; sideritic.
Y	0.56	Clarain, with abundant thin- to thick-banded vitrain.
Y	0.20	Durain, argillaceous.
Y	0.59	Clarain, with scattered thin- to medium-banded vitrain.
Y	0.10	Durain, with thin-banded vitrain.
Y	0.13	Vitrain.
Y	0.02	Fusain.
Y	0.36	Clarain, with large pyrite nodules (1-2 cm thick).
Y	0.10	Durain and clarain, mixed.
Y	0.39	Durain, with scattered thin-banded clarain.
Y	1.25	Clarain.
N		Siltstone.
		Lower split of Broas, 7 m below.

COAL ANALYSIS REPORT

LABORATORY NO: L04861 FIELD NO: KGS 149 U.S.G.S. NO: W209662
LABORATORY: USBM REPORT DATE: Dec/01/1980

AIR DRIED LOSS: 1.70%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.80%		
VOLATILE MATTER	36.90%	38.36%	40.96%
FIXED CARBON	53.20%	55.30%	59.05%
ASH	6.10%	6.34%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.40%	5.17%	5.52%
CARBON	73.40%	76.30%	81.47%
NITROGEN	1.50%	1.56%	1.66%
TOTAL SULFUR	0.70%	0.73%	0.78%
OXYGEN	12.90%	9.90%	10.57%
ASH	6.10%	36.34%	
HEATING VALUE (BTU/LB):	13102	13620	14542
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.09%	0.09%	0.10%
ORGANIC	0.64%	0.67%	0.71%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.1

COAL SAMPLING REPORT

LABORATORY NO: L04855 FIELD NO: KGS 163 U.S.G.S. NO: W209663
SAMPLER: Currens & Kung AGENCY: KGS DATE: Dec/05/1979
7.5' QUAD: Ivyton COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 12 ROW N TIER 79 6000 FT FSL, 4750 FT FEL
LATITUDE: 37 DEG 37 MIN 59 SEC LONGITUDE: 82 DEG 56 MIN 59 SEC
ELEVATION (FT): 1320.00, OF POINT AT base of 163, USING topo
COMMENTARY:
REGIONAL COAL NAME: Broas zone GEO. MAP COAL NAME: Broas
REPORTED COAL NAME: Broas FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh
RECOVERY METHOD: channel SAMPLING REGIME: Swanson & Huffman
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 46.7, SAMPLE 41.1, COAL ONLY 40.3
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 210, SET 2 300, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	9.84	Siltstone.
N	13.12	Sandstone, medium-gray, medium-grained, crossbedded, carbonaceous, micaceous.
Y	0.13	Clarain.
Y	0.11	Durain, argillaceous.
Y	0.26	Clarain.
N	0.46	Shale, medium-gray, rooted.
Y	1.15	Clarain, mixed with durain.
Y	0.07	Siltstone.
Y	0.66	Clarain, pyritic.
Y	0.36	Durain and clarain.
Y	0.69	Clarain.
N		Siltstone.

COAL ANALYSIS REPORT

LABORATORY NO: L04855 FIELD NO: KGS 163 U.S.G.S. NO: W209663
LABORATORY: USBM REPORT DATE: Nov/28/1980

AIR DRIED LOSS: 1.40%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.20%		
VOLATILE MATTER	36.20%	37.40%	42.29%
FIXED CARBON	49.40%	51.04%	57.71%
ASH	11.20%	11.57%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.20%	5.00%	5.66%
CARBON	69.50%	71.80%	81.19%
NITROGEN	1.40%	1.45%	1.64%
TOTAL SULFUR	0.70%	0.72%	0.82%
OXYGEN	12.00%	9.46%	10.69%
ASH	11.20%	11.57%	
HEATING VALUE (BTU/LB):	12462	12875	14558
SULFUR FORMS:			
SULFATE	0.00%	0.00%	0.00%
PYRITIC	0.48%	0.50%	0.56%
ORGANIC	0.17%	0.18%	0.20%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.1

COAL SAMPLING REPORT

LABORATORY NO: L04860 FIELD NO: KGS 164 U.S.G.S. NO: W209664
SAMPLER: Currens & Kung AGENCY: KGS DATE: Dec/18/1979
7.5' QUAD: Ivyton COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 5 ROW N TIER 79 3300 FT FSL, 2250 FT FEL
LATITUDE: 37 DEG 39 MIN 33 SEC LONGITUDE: 82 DEG 59 MIN 28 SEC
ELEVATION (FT): 1200.00, OF POINT AT base of 164, USING topo
COMMENTARY:
REGIONAL COAL NAME: U Peach Orchard GEO. MAP COAL NAME: U Peach Orchd
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom bench
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, faced-up
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 10.4, SAMPLE 10.4, COAL ONLY 10.4
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 165.
N	1.02	Siltstone, medium-gray, intensively rooted.
Y	0.59	Clarain.
Y	0.02	Pyrite, somewhat nodular.
Y	0.23	Durain, with scattered clarain.
Y	0.03	Fusain.
N	0.30	Clarain, with abundant medium- to thick-banded vitrain, scattered fusain.
		See KGS 167 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: L04860 FIELD NO: KGS 164 U.S.G.S. NO: W209664
LABORATORY: USBM REPORT DATE: Dec/01/1980

AIR DRIED LOSS: 1.30%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.20%		
VOLATILE MATTER	36.00%	37.19%	42.55%
FIXED CARBON	48.60%	50.21%	57.45%
ASH	12.20%	12.60%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.20%	5.00%	5.72%
CARBON	67.50%	69.73%	79.79%
NITROGEN	1.40%	1.45%	1.65%
TOTAL SULFUR	1.90%	1.96%	2.25%
OXYGEN	11.70%	9.26%	10.59%
ASH	12.20%	12.60%	
HEATING VALUE (BTU/LB):	12210	12614	14432
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	1.28%	1.32%	1.51%
ORGANIC	0.66%	0.68%	0.78%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2340 deg F
SOFTENING TEMP.	2420 deg F
FLUID TEMP.	2540 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	3.1

COAL SAMPLING REPORT

LABORATORY NO: L04854 FIELD NO: KGS 165 U.S.G.S. NO: W209665
SAMPLER: Currens & Kung AGENCY: KGS DATE: Dec/18/1979
7.5' QUAD: Ivyton COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 5 ROW N TIER 79 3300 FT FSL, 2250 FT FEL
LATITUDE: 37 DEG 39 MIN 33 SEC LONGITUDE: 82 DEG 59 MIN 28 SEC
ELEVATION (FT): 1202.00, OF POINT AT base of 165, USING topo
COMMENTARY:
REGIONAL COAL NAME: U Peach Orchd GEO. MAP COAL NAME: U Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): middle bench
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, mud-streaked, faced-up
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 16.1, SAMPLE 16.1, COAL ONLY 16.1
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 166.
N	0.79	Siltstone, medium-gray, intensively rooted.
Y	1.21	Clarain and vitrain, intermixed, with abundant vitrain, medium- to thick-banded.
Y	0.03	Fusain.
Y	0.10	Clarain.
		See KGS 164 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: L04854 FIELD NO: KGS 165 U.S.G.S. NO: W209665
LABORATORY: USBM REPORT DATE: Nov/28/1980

AIR DRIED LOSS: 1.70%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.70%		
VOLATILE MATTER	37.60%	39.04%	42.48%
FIXED CARBON	50.90%	52.85%	57.51%
ASH	7.80%	8.10%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.50%	5.28%	5.75%
CARBON	71.90%	74.66%	81.24%
NITROGEN	1.50%	1.56%	1.69%
TOTAL SULFUR	0.70%	0.73%	0.79%
OXYGEN	12.50%	9.67%	10.53%
ASH	7.80%	8.10%	
HEATING VALUE (BTU/LB):	12970	13468	14655
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.48%	0.50%	0.54%
ORGANIC	0.26%	0.27%	0.29%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.1

COAL SAMPLING REPORT

LABORATORY NO: L04862 FIELD NO: KGS 167 U.S.G.S. NO: W209666
SAMPLER: Currens & Kung AGENCY: KGS DATE: Dec/18/1979
7.5' QUAD: Ivyton COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 5 ROW N TIER 79 3200 FT FSL, 2500 FT FEL
LATITUDE: 37 DEG 39 MIN 32 SEC LONGITUDE: 82 DEG 59 MIN 31 SEC
ELEVATION (FT): 1173.00, OF POINT AT base of 167, USING topo
COMMENTARY: Sample site is 200 feet south of KGS 166 site.
REGIONAL COAL NAME: L Peach Orchd GEO. MAP COAL NAME: L Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, wet
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 26.4, SAMPLE 23.2, COAL ONLY 23.2
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 164.
N	26.90	Siltstone, medium-gray; top 3 feet rooted; sideritic; 1 to 2 feet of black, silty, laminated, carbonaceous shale at base; nonfossiliferous.
Y	1.18	Clarain, with abundant durain and fusain near top; wet, obscured.
N	0.26	Siltstone, medium-gray, rooted, plastic when wet.
Y	0.75	Clarain, with medium- to thick-banded vitrain, wet, obscured.
N		Siltstone, rooted(?).

COAL ANALYSIS REPORT

LABORATORY NO: L04862 FIELD NO: KGS 167 U.S.G.S. NO: W209666
LABORATORY: USBM REPORT DATE: Dec/02/1980

AIR DRIED LOSS: 1.50%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.30%		
VOLATILE MATTER	35.60%	36.81%	42.63%
FIXED CARBON	47.90%	49.53%	57.37%
ASH	13.20%	13.65%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.10%	4.89%	5.67%
CARBON	67.30%	69.59%	80.60%
NITROGEN	1.40%	1.45%	1.68%
TOTAL SULFUR	1.00%	1.03%	1.20%
OXYGEN	12.00%	9.39%	10.85%
ASH	13.20%	13.65%	
HEATING VALUE (BTU/LB):	12064	12475	14448
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.14%	0.14%	0.17%
ORGANIC	0.89%	0.92%	1.07%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.7

COAL SAMPLING REPORT

LABORATORY NO: L05034 FIELD NO: KGS 295 U.S.G.S. NO: W209850
SAMPLER: Currens & Kung AGENCY: KGS DATE: Jan/15/1980
7.5' QUAD: Ivyton COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 6 ROW 0 TIER 79 2200 FT FSL, 600 FT FEL
LATITUDE: 37 DEG 43 MIN 22 SEC LONGITUDE: 82 DEG 59 MIN 7 SEC
ELEVATION (FT): 610.00, OF POINT AT base of 294, USING survey
COMMENTARY:
REGIONAL COAL NAME: Fire Clay GEO. MAP COAL NAME: Fire Clay
REPORTED COAL NAME: Fire Clay FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, construction site; CONDITION, a few weeks old
SAMPLE CONDITION: fresh, wet, muddy
RECOVERY METHOD: channel SAMPLING REGIME: TK partings included
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 15.3, SAMPLE 15.3, COAL ONLY 8.7
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 140, SET 2 240, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	1.64	Coal, weathered.
N	26.25	Siltstone, medium-gray, arenaceous, sideritic.
N	0.98	Siltstone, very carbonaceous, canneloid.
N	0.98	Sandstone, medium-gray, rooted, argillaceous, micaceous, carbonaceous.
Y	0.10	Clarain.
Y	0.10	Siltstone, light-gray, soft, rooted.
Y	0.46	Flint clay, dark-gray to black.
Y	0.62	Clarain, with scattered medium-banded vitrain; abundant durain at base.
N	1.64	Claystone, silty, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: L05034 FIELD NO: KGS 295 U.S.G.S. NO: W209850
LABORATORY: USBM REPORT DATE: Dec/01/1980

AIR DRIED LOSS: 1.30%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	2.80%		
VOLATILE MATTER	23.10%	23.77%	52.62%
FIXED CARBON	20.80%	21.40%	47.38%
ASH	53.30%	54.84%	
ULTIMATE ANALYSIS:			
HYDROGEN	3.20%	2.97%	6.58%
CARBON	31.90%	32.82%	72.67%
NITROGEN	0.60%	0.62%	1.37%
TOTAL SULFUR	0.40%	0.41%	0.91%
OXYGEN	10.50%	8.34%	18.47%
ASH	53.30%	54.84%	
HEATING VALUE (BTU/LB):	5531	5690	12599
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.02%
PYRITIC	0.13%	0.13%	0.30%
ORGANIC	0.29%	0.30%	0.66%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX
POUNDS OF SULFUR DIOXIDE PER MILLION 1.4

COAL SAMPLING REPORT

LABORATORY NO: L05033 FIELD NO: KGS 298 U.S.G.S. NO: W209853
SAMPLER: Currens AGENCY: KGS DATE: Feb/20/1980
7.5' QUAD: David COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 9 ROW M TIER 79 2300 FT FSL, 4050 FT FEL
LATITUDE: 37 DEG 33 MIN 23 SEC LONGITUDE: 82 DEG 56 MIN 50 SEC
ELEVATION (FT): 1100.00, OF POINT AT base of 298, USING topo
COMMENTARY:
REGIONAL COAL NAME: Hazard zone GEO. MAP COAL NAME: Hazard
REPORTED COAL NAME: Hazard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, mine portal; CONDITION, surface mine, 8 months old
SAMPLE CONDITION: muddy, dry, faced-up
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 45.9, SAMPLE 45.9, COAL ONLY 45.9
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 300, SET 2 40, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N		Siltstone, black, with abundant plant fragments and kettle bottom.
N	0.56	Siltstone, medium-gray, arenaceous.
Y	0.20	Durain.
Y	0.23	Durain, mixed with clarain.
Y	0.16	Clarain.
Y	0.02	Fusain.
Y	1.05	Clarain, with scattered pyrite nodules (2 x 10 cm).
Y	0.11	Durain.
Y	0.41	Clarain.
Y	0.72	Durain, with scattered clarain; pyritic.
Y	0.23	Clarain.
Y	0.10	Durain.
Y	0.59	Clarain, with abundant medium-banded durain at top.
N		Siltstone, plastic, rooted, 8 inches thick (reported).
N		Coal.

COAL ANALYSIS REPORT

LABORATORY NO: L05033 FIELD NO: KGS 298 U.S.G.S. NO: W209853
LABORATORY: USBM REPORT DATE: Dec/01/1980

AIR DRIED LOSS: 1.80%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.40%		
VOLATILE MATTER	35.40%	36.65%	42.04%
FIXED CARBON	48.80%	50.52%	57.95%
ASH	12.40%	12.84%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.00%	4.78%	5.49%
CARBON	69.00%	71.43%	81.94%
NITROGEN	1.30%	1.35%	1.54%
TOTAL SULFUR	1.00%	1.04%	1.19%
OXYGEN	11.30%	8.56%	9.84%
ASH	12.40%	12.84%	
HEATING VALUE (BTU/LB):	12270	12702	14572
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.24%	0.25%	0.29%
ORGANIC	0.76%	0.79%	0.90%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION
SOFTENING TEMP.
FLUID TEMP.

FREE SWELLING INDEX
POUNDS OF SULFUR DIOXIDE PER MILLION BTU 1.6

COAL SAMPLING REPORT

LABORATORY NO: L05187 FIELD NO: KGS 299 U.S.G.S. NO: W209870
SAMPLER: Currens & Kung AGENCY: KGS DATE: Mar/04/1980
7.5' QUAD: Isonville COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 24 ROW S TIER 78 1000 FT FSL, 3450 FT FEL
LATITUDE: 38 DEG 0 MIN 10 SEC LONGITUDE: 83 DEG 3 MIN 43 SEC
ELEVATION (FT): 992.00, OF POINT AT base of 299, USING altimeter
COMMENTARY: Barometric elevation not adjusted for atmospheric changes.
REGIONAL COAL NAME: Peach Orchard zone GEO. MAP COAL NAME: Mudseam
REPORTED COAL NAME: Mudseam FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom bench
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, wet
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 19.7, SAMPLE 19.7, COAL ONLY 19.7
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 315, SET 2 25, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 300.
N	0.46	Siltstone, dark-gray to black, plastic.
Y	0.46	Clarain, with abundant durain, pyritic.
Y	0.62	Durain, with scattered thin-banded vitrain.
Y	0.56	Clarain, with abundant durain, pyritic.
N		Siltstone, dark-gray, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: L05187 FIELD NO: KGS 299 U.S.G.S. NO: W209870
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 2.90%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	4.70%		
VOLATILE MATTER	39.70%	41.66%	44.76%
FIXED CARBON	49.00%	51.42%	55.24%
ASH	6.60%	6.93%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.60%	5.32%	5.72%
CARBON	70.90%	74.40%	79.93%
NITROGEN	1.40%	1.47%	1.58%
TOTAL SULFUR	2.70%	2.83%	3.04%
OXYGEN	12.80%	9.05%	9.73%
ASH	6.60%	6.93%	
HEATING VALUE (BTU/LB):	12873	13508	14513
SULFUR FORMS:			
SULFATE	0.02%	0.02%	0.02%
PYRITIC	2.12%	2.22%	2.39%
ORGANIC	0.53%	0.56%	0.60%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2060 deg F
SOFTENING TEMP.	2190 deg F
FLUID TEMP.	2310 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	4.2

COAL SAMPLING REPORT

LABORATORY NO: L05184 FIELD NO: KGS 300 U.S.G.S. NO: W209871
SAMPLER: Currens & Kung AGENCY: KGS DATE: Mar/04/1980
7.5' QUAD: Isonville COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 24 ROW S TIER 78 1000 FT FSL, 3450 FT FEL
LATITUDE: 38 DEG 0 MIN 10 SEC LONGITUDE: 83 DEG 3 MIN 43 SEC
ELEVATION (FT): 994.00, OF POINT AT base of 300, USING altimeter
COMMENTARY: Barometric elevation not adjusted for atmospheric changes.
REGIONAL COAL NAME: Peach Orchard zone GEO. MAP COAL NAME: Mudseam
REPORTED COAL NAME: Mudseam FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): top bench
EXPOSURE: TYPE, surface mine; CONDITION, a few days old
SAMPLE CONDITION: fresh, wet
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 8.1, SAMPLE 8.1, COAL ONLY 7.9
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 315, SET 2 25, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	16.40	Sandstone, light-gray to buff, medium-grained, with scattered liesegang bedding.
N	6.56	Siltstone, medium-gray, highly sideritic, slightly arenaceous.
Y	0.16	Clarain.
Y	0.02	Pyrite.
Y	0.49	Clarain.
		See KGS 299 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: L05184 FIELD NO: KGS 300 U.S.G.S. NO: W209871
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 2.00%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.80%		
VOLATILE MATTER	38.30%	39.81%	46.65%
FIXED CARBON	43.80%	45.53%	53.35%
ASH	14.10%	14.66%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.10%	4.86%	5.69%
CARBON	64.50%	67.05%	78.56%
NITROGEN	1.30%	1.35%	1.58%
TOTAL SULFUR	3.10%	3.22%	3.78%
OXYGEN	11.90%	8.86%	10.39%
ASH	14.10%	14.66%	
HEATING VALUE (BTU/LB):	11764	12229	14329
SULFUR FORMS:			
SULFATE	0.02%	0.02%	0.02%
PYRITIC	1.69%	1.76%	2.06%
ORGANIC	1.41%	1.47%	1.72%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2290 deg F
SOFTENING TEMP.	2400 deg F
FLUID TEMP.	2480 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	5.3

COAL SAMPLING REPORT

LABORATORY NO: L05182 FIELD NO: KGS 301 U.S.G.S. NO: W209872
SAMPLER: Currens & Kung AGENCY: KGS DATE: Mar/04/1980
7.5' QUAD: Isonville COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 24 ROW S TIER 78 1100 FT FSL, 2300 FT FEL
LATITUDE: 38 DEG 0 MIN 11 SEC LONGITUDE: 83 DEG 3 MIN 29 SEC
ELEVATION (FT): 1097.00, OF POINT AT base of 301, USING altimeter
COMMENTARY: Barometric elevation not adjusted for atmospheric changes.
REGIONAL COAL NAME: U Peach Orchard GEO. MAP COAL NAME: Sebastian
REPORTED COAL NAME: Sebastian FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: slightly weathered, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 18.1, SAMPLE 18.1, COAL ONLY 18.1
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 302.
N	1.31	Siltstone, dark-gray, rooted.
N	4.59	Siltstone, medium-gray, rooted.
N	32.81	Siltstone, medium-gray, arenaceous, sideritic.
Y	0.26	Canneloid coal, with scattered medium-banded vitrain.
Y	0.07	Durain.
Y	0.30	Clarain.
Y	0.07	Durain.
Y	0.69	Clarain.
Y	0.13	Durain.
N	0.30	Siltstone, black, plastic, carbonaceous.
N	0.13	Clarain.
N	3.18	Siltstone, medium- to dark-gray, rooted, sideritic; carbonaceous at top; overlies lower split of Sebastian.

COAL ANALYSIS REPORT

LABORATORY NO: L05182 FIELD NO: KGS 301 U.S.G.S. NO: W209872
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 3.90%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	5.80%		
VOLATILE MATTER	35.00%	37.16%	42.42%
FIXED CARBON	47.50%	50.43%	57.57%
ASH	11.70%	12.42%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.20%	4.83%	5.52%
CARBON	66.20%	70.28%	80.24%
NITROGEN	1.20%	1.27%	1.45%
TOTAL SULFUR	0.70%	0.74%	0.85%
OXYGEN	15.00%	10.46%	11.94%
ASH	11.70%	12.42%	
HEATING VALUE (BTU/LB):	11733	12456	14222
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.12%	0.13%	0.15%
ORGANIC	0.57%	0.61%	0.69%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2170 deg F
SOFTENING TEMP.	2350 deg F
FLUID TEMP.	2480 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.2

COAL SAMPLING REPORT

LABORATORY NO: L05188 FIELD NO: KGS 302 U.S.G.S. NO: W209873
SAMPLER: Currens & Kung AGENCY: KGS DATE: Mar/04/1980
7.5' QUAD: Isonville COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 24 ROW S TIER 78 1300 FT FSL, 2300 FT FEL
LATITUDE: 38 DEG 0 MIN 13 SEC LONGITUDE: 83 DEG 3 MIN 29 SEC
ELEVATION (FT): 1137.00, OF POINT AT base of 302, USING altimeter
COMMENTARY: Barometric elevation not adjusted for atmospheric changes.
REGIONAL COAL NAME: Laurel GEO. MAP COAL NAME: Laurel
REPORTED COAL NAME: Laurel FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: slightly weathered, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 39.8, SAMPLE 32.3, COAL ONLY 32.3
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	9.84	Siltstone, medium-gray, arenaceous, sideritic, weathered.
Y	0.43	Clarain, pyritic.
N	0.39	Siltstone, black, carbonaceous, approaches being canneloid.
Y	0.69	Clarain.
N	0.23	Siltstone, black, carbonaceous, rooted.
Y	1.57	Clarain, pyritic (2 x 10 cm nodules); abundant vitrain near base; scattered fusain. See KGS 301 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: L05188 FIELD NO: KGS 302 U.S.G.S. NO: W209873
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 3.90%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	6.00%		
VOLATILE MATTER	29.20%	31.06%	42.94%
FIXED CARBON	38.80%	41.28%	57.06%
ASH	26.00%	27.66%	
ULTIMATE ANALYSIS:			
HYDROGEN	4.40%	3.97%	5.48%
CARBON	52.70%	56.06%	77.50%
NITROGEN	1.00%	1.06%	1.47%
TOTAL SULFUR	1.10%	1.17%	1.62%
OXYGEN	14.80%	10.08%	13.93%
ASH	26.00%	27.66%	
HEATING VALUE (BTU/LB):	9175	9760	13493
SULFUR FORMS:			
SULFATE	0.02%	0.02%	0.03%
PYRITIC	0.42%	0.45%	0.62%
ORGANIC	0.68%	0.72%	1.00%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX
POUNDS OF SULFUR DIOXIDE PER MILLION 2.4

COAL SAMPLING REPORT

LABORATORY NO: L03163 FIELD NO: KGS 308 U.S.G.S. NO: W209894
SAMPLER: Currens AGENCY: KGS DATE: Mar/25/1980
7.5' QUAD: Isonville COUNTY: Elliott DISTRICT: Licking River
CARTER COORDINATE: SEC 19 ROW S TIER 77 4500 FT FSL, 1900 FT FEL
LATITUDE: 38 DEG 1 MIN 44 SEC LONGITUDE: 83 DEG 6 MIN 24 SEC
ELEVATION (FT): 998.80, OF POINT AT base of 308, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard zone GEO. MAP COAL NAME: Mudseam
REPORTED COAL NAME: Mudseam FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): middle split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 11.2, SAMPLE 11.2, COAL ONLY 11.2
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 195, SET 2 125, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	9.84	Siltstone.
N	0.33	Coal, not sampled.
N	16.40	Siltstone, medium-gray, dark-gray at base, slightly sideritic; top 2 feet rooted.
Y	0.36	Clarain, with thin- to medium-banded vitrain.
Y	0.02	Fusain, argillaceous(?).
Y	0.30	Clarain, with zone of scattered durain.
Y	0.03	Clarain, with very thin band of oxidized marcasite.
Y	0.23	Clarain.
		See KGS 309 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: L03163 FIELD NO: KGS 308 U.S.G.S. NO: W209894
LABORATORY: USBM REPORT DATE: Aug/06/1980

AIR DRIED LOSS: 0.20%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	4.80%		
VOLATILE MATTER	36.10%	37.92%	43.34%
FIXED CARBON	47.20%	49.58%	56.66%
ASH	11.90%	12.50%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.10%	4.79%	5.48%
CARBON	65.70%	69.01%	78.87%
NITROGEN	1.20%	1.26%	1.44%
TOTAL SULFUR	4.40%	4.62%	5.28%
OXYGEN	11.70%	7.82%	8.93%
ASH	11.90%	12.50%	
HEATING VALUE (BTU/LB):	11898	12498	14284
SULFUR FORMS:			
SULFATE	0.11%	0.12%	0.13%
PYRITIC	3.37%	3.54%	4.05%
ORGANIC	0.91%	0.96%	1.09%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1960 deg F
SOFTENING TEMP.	2010 deg F
FLUID TEMP.	2050 deg F

FREE SWELLING INDEX	2.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	7.4

COAL SAMPLING REPORT

LABORATORY NO: L03167 FIELD NO: KGS 315 U.S.G.S. NO: W209898
SAMPLER: Currens AGENCY: KGS DATE: Mar/27/1980
7.5' QUAD: Salyersville South COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 24 ROW 0 TIER 78 4000 FT FSL, 2000 FT FEL
LATITUDE: 37 DEG 40 MIN 40 SEC LONGITUDE: 83 DEG 3 MIN 25 SEC
ELEVATION (FT): 1260.00, OF POINT AT base of 315, USING topo
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard z GEO. MAP COAL NAME: Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: slightly weathered, clean, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 11.4, SAMPLE 11.4, COAL ONLY 11.4
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 310, SET 2 220, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 316.
N	0.66	Siltstone, dark-brownish-gray, carbonaceous, rooted.
Y	0.82	Clarain, with abundant thin- to medium-banded vitrain.
Y	0.13	Durain.
N		Siltstone, dark-gray, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: L03167 FIELD NO: KGS 315 U.S.G.S. NO: W209898
LABORATORY: USBM REPORT DATE: Aug/06/1980

AIR DRIED LOSS: 0.30%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	6.50%		
VOLATILE MATTER	37.00%	39.57%	41.85%
FIXED CARBON	51.40%	54.97%	58.14%
ASH	5.10%	5.45%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.30%	4.89%	5.17%
CARBON	70.40%	75.29%	79.64%
NITROGEN	1.50%	1.60%	1.70%
TOTAL SULFUR	1.00%	1.07%	1.13%
OXYGEN	16.70%	11.70%	12.36%
ASH	5.10%	5.45%	
HEATING VALUE (BTU/LB):	12478	13345	14115
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.10%	0.11%	0.11%
ORGANIC	0.91%	0.97%	1.03%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2520 deg F
SOFTENING TEMP.	2570 deg F
FLUID TEMP.	2620 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.6

COAL SAMPLING REPORT

LABORATORY NO: L05195 FIELD NO: KGS 316 U.S.G.S. NO: W209899
SAMPLER: Currens AGENCY: KGS DATE: Mar/27/1980
7.5' QUAD: Salyersville South COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 24 ROW 0 TIER 78 4000 FT FSL, 2000 FT FEL
LATITUDE: 37 DEG 40 MIN 40 SEC LONGITUDE: 83 DEG 3 MIN 25 SEC
ELEVATION (FT): 1262.00, OF POINT AT base of 316, USING topo
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard z GEO. MAP COAL NAME: Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: clean, dry, fresh
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 24.4, SAMPLE 24.4, COAL ONLY 24.4
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 210, SET 2 310, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	16.40	Disturbed material.
N	0.33	Siltstone, dark-gray.
Y	0.30	Clarain.
Y	0.03	Fusain.
Y	0.79	Clarain, with scattered thin zones of durain.
Y	0.03	Fusain.
Y	0.36	Clarain.
Y	0.10	Vitrain.
Y	0.43	Durain.
		See KGS 315 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: L05195 FIELD NO: KGS 316 U.S.G.S. NO: W209899
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 2.60%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	4.10%		
VOLATILE MATTER	33.70%	35.14%	40.36%
FIXED CARBON	49.80%	51.93%	59.64%
ASH	12.40%	12.93%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.00%	4.74%	5.44%
CARBON	67.90%	70.81%	81.32%
NITROGEN	1.30%	1.36%	1.56%
TOTAL SULFUR	0.80%	0.83%	0.96%
OXYGEN	12.70%	9.33%	10.72%
ASH	12.40%	12.93%	
HEATING VALUE (BTU/LB):	12021	12536	14396
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.08%	0.08%	0.10%
ORGANIC	0.67%	0.70%	0.80%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.3

COAL SAMPLING REPORT

LABORATORY NO: L05194 FIELD NO: KGS 317 U.S.G.S. NO: W209900
SAMPLER: Currens AGENCY: KGS DATE: Mar/27/1980
7.5' QUAD: Salyersville South COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 24 ROW 0 TIER 78 3600 FT FSL, 2700 FT FEL
LATITUDE: 37 DEG 40 MIN 36 SEC LONGITUDE: 83 DEG 3 MIN 34 SEC
ELEVATION (FT): 1280.00, OF POINT AT base of 317, USING topo
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard z GEO. MAP COAL NAME: Peach Orchard
REPORTED COAL NAME: Peach Orchard rider FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): rider
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: dry, fresh
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 8.3, SAMPLE 8.3, COAL ONLY 8.3
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N		Removed.
Y	0.13	Clarain.
Y	0.20	Durain, with scattered thin-banded vitrain.
Y	0.36	Clarain.
N		KGS 315-316 approximately 20 feet lower.

COAL ANALYSIS REPORT

LABORATORY NO: L05194 FIELD NO: KGS 317 U.S.G.S. NO: W209900
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 2.10%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.50%		
VOLATILE MATTER	42.10%	43.63%	47.36%
FIXED CARBON	46.80%	48.50%	52.65%
ASH	7.60%	7.88%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.60%	5.40%	5.86%
CARBON	72.00%	74.61%	80.99%
NITROGEN	1.30%	1.35%	1.46%
TOTAL SULFUR	1.90%	1.97%	2.14%
OXYGEN	11.70%	8.79%	9.55%
ASH	7.60%	7.88%	
HEATING VALUE (BTU/LB):	13041	13514	14670
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.81%	0.84%	0.91%
ORGANIC	1.09%	1.13%	1.23%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2520 deg F
SOFTENING TEMP.	2610 deg F
FLUID TEMP.	2730 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	2.9

COAL SAMPLING REPORT

LABORATORY NO: L05189 FIELD NO: KGS 318 U.S.G.S. NO: W209901
SAMPLER: Currens AGENCY: KGS DATE: Mar/27/1980
7.5' QUAD: Campton COUNTY: Wolfe DISTRICT: Licking River
CARTER COORDINATE: SEC 4 ROW 0 TIER 72 450 FT FSL, 2900 FT FEL
LATITUDE: 37 DEG 44 MIN 4 SEC LONGITUDE: 83 DEG 33 MIN 36 SEC
ELEVATION (FT): 1100.00, OF POINT AT base of 318, USING topo
COMMENTARY:
REGIONAL COAL NAME: U Elkhorn No.2 GEO. MAP COAL NAME: Grassy
REPORTED COAL NAME: Grassy FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, construction site; CONDITION, active
SAMPLE CONDITION: weathered, damp
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 8.1, SAMPLE 8.1, COAL ONLY 7.9
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	32.81	Siltstone, weathered.
N	1.00	Coal bloom.
N	5.58	Siltstone, light-gray, sideritic.
Y	0.13	Durain.
Y	0.02	Clay.
Y	0.52	Clarain, with durain and scattered thin-banded vitrain (obscured).
N	4.43	Siltstone, light-gray; rooted at top.
N	0.10	Coal, weathered.
N	0.16	Siltstone, dark-gray, rooted.
N	0.13	Coal, weathered.
		Siltstone, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: L05189 FIELD NO: KGS 318 U.S.G.S. NO: W209901
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 3.20%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	4.90%		
VOLATILE MATTER	34.20%	35.96%	39.35%
FIXED CARBON	52.70%	55.41%	60.64%
ASH	8.20%	8.62%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.30%	5.00%	5.47%
CARBON	69.90%	73.50%	80.43%
NITROGEN	1.50%	1.58%	1.73%
TOTAL SULFUR	1.00%	1.05%	1.15%
OXYGEN	14.10%	10.25%	11.22%
ASH	8.20%	8.62%	
HEATING VALUE (BTU/LB):	12481	13124	14362
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.22%	0.23%	0.25%
ORGANIC	0.82%	0.86%	0.94%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.6

COAL SAMPLING REPORT

LABORATORY NO: L05196 FIELD NO: KGS 166 U.S.G.S. NO: W209902
SAMPLER: Currens & Kung AGENCY: KGS DATE: Dec/18/1979
7.5' QUAD: Ivyton COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 5 ROW N TIER 79 3300 FT FSL, 2250 FT FEL
LATITUDE: 37 DEG 39 MIN 33 SEC LONGITUDE: 82 DEG 59 MIN 28 SEC
ELEVATION (FT): 1204.00, OF POINT AT base of 166, USING topo
COMMENTARY:
REGIONAL COAL NAME: U Peach Orchd GEO. MAP COAL NAME: U Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): top bench
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, mud-streaked, faced-up
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 8.7, SAMPLE 8.7, COAL ONLY 8.7
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	16.40	Siltstone, coarsening upward to medium-grained sandstone.
Y	0.72	Coal, with clarain abundant in lower half; couldn't reach for proper description; see KGS 165 for underlying strata; abundant mud in coal cleat; additional contamination caused by mud frozen to coal and inaccessibility of coal.

COAL ANALYSIS REPORT

LABORATORY NO: L05196 FIELD NO: KGS 166 U.S.G.S. NO: W209902
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 2.10%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.70%		
VOLATILE MATTER	37.70%	39.15%	47.60%
FIXED CARBON	41.50%	43.09%	52.40%
ASH	17.10%	17.76%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.30%	5.07%	6.17%
CARBON	63.80%	66.25%	80.55%
NITROGEN	1.30%	1.35%	1.64%
TOTAL SULFUR	0.90%	0.93%	1.14%
OXYGEN	11.70%	8.64%	10.50%
ASH	17.10%	17.76%	
HEATING VALUE (BTU/LB):	11523	11966	14549
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.20%	0.21%	0.25%
ORGANIC	0.69%	0.72%	0.87%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.6

COAL SAMPLING REPORT

LABORATORY NO: L05192 FIELD NO: KGS 305 U.S.G.S. NO: W209903
SAMPLER: Currens & Kung AGENCY: KGS DATE: Mar/19/1980
7.5' QUAD: White Oak COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 19 ROW Q TIER 76 150 FT FSL, 450 FT FEL
LATITUDE: 37 DEG 51 MIN 1 SEC LONGITUDE: 83 DEG 11 MIN 6 SEC
ELEVATION (FT): 990.00, OF POINT AT base of 305, USING topo
COMMENTARY:
REGIONAL COAL NAME: Hazard zone GEO. MAP COAL NAME: Prater
REPORTED COAL NAME: Prater FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: very fresh
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 19.3, SAMPLE 19.3, COAL ONLY 19.3
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 145, SET 2 225, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 306.
N	0.66	Claystone, dark-gray, rooted, plastic.
N	9.51	Siltstone, medium-gray, sideritic, carbonaceous, arenaceous.
Y	0.56	Durain, with abundant thin-banded vitrain.
Y	0.72	Clarain, with abundant thin- to medium-banded vitrain.
Y	0.10	Vitrain.
Y	0.23	Clarain, with abundant thin- to medium-banded vitrain.
N		Claystone, dark-gray, plastic, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: L05192 FIELD NO: KGS 305 U.S.G.S. NO: W209903
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 4.60%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	6.50%		
VOLATILE MATTER	38.90%	41.60%	42.98%
FIXED CARBON	51.60%	55.19%	57.02%
ASH	3.00%	3.21%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.90%	5.53%	5.72%
CARBON	73.40%	78.50%	81.11%
NITROGEN	1.60%	1.71%	1.77%
TOTAL SULFUR	0.80%	0.86%	0.88%
OXYGEN	15.30%	10.19%	10.52%
ASH	3.00%	3.21%	
HEATING VALUE (BTU/LB):	13121	14033	14499
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.08%	0.09%	0.09%
ORGANIC	0.75%	0.80%	0.83%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.2

COAL SAMPLING REPORT

LABORATORY NO: L05193 FIELD NO: KGS 306 U.S.G.S. NO: W209904
SAMPLER: Currens & Kung AGENCY: KGS DATE: Mar/19/1980
7.5' QUAD: White Oak COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 19 ROW Q TIER 76 450 FT FSL, 400 FT FEL
LATITUDE: 37 DEG 51 MIN 4 SEC LONGITUDE: 83 DEG 11 MIN 5 SEC
ELEVATION (FT): 1000.00, OF POINT AT base of 306, USING topo
COMMENTARY:
REGIONAL COAL NAME: Hazard zone GEO. MAP COAL NAME: Prater
REPORTED COAL NAME: Prater FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): top split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: slightly weathered, faced-up
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 8.7, SAMPLE 4.3, COAL ONLY 4.3
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		See KGS 307 for overlying strata.
N	7.55	Siltstone, medium-gray, sideritic, carbonaceous.
N	0.33	Siltstone, dark-gray to black, nonfossiliferous.
Y	0.20	Clarain.
N	0.36	Siltstone, black, hard, rooted.
Y	0.16	Clarain.
		See KGS 305 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: L05193 FIELD NO: KGS 306 U.S.G.S. NO: W209904
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 3.00%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	4.40%		
VOLATILE MATTER	30.90%	32.32%	43.15%
FIXED CARBON	40.70%	42.57%	56.84%
ASH	24.00%	25.10%	
ULTIMATE ANALYSIS:			
HYDROGEN	4.60%	4.30%	5.74%
CARBON	57.30%	59.94%	80.03%
NITROGEN	1.10%	1.15%	1.54%
TOTAL SULFUR	1.50%	1.57%	2.09%
OXYGEN	11.50%	7.94%	10.60%
ASH	24.00%	25.10%	
HEATING VALUE (BTU/LB):	10146	10613	14170
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	1.03%	1.08%	1.44%
ORGANIC	0.46%	0.48%	0.64%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	3.0

COAL SAMPLING REPORT

LABORATORY NO: L05190 FIELD NO: KGS 307 U.S.G.S. NO: W209905
SAMPLER: Currens & Kung AGENCY: KGS DATE: Mar/19/1980
7.5' QUAD: White Oak COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 19 ROW Q TIER 76 200 FT FSL, 1200 FT FEL
LATITUDE: 37 DEG 51 MIN 2 SEC LONGITUDE: 83 DEG 11 MIN 15 SEC
ELEVATION (FT): 1015.00, OF POINT AT base of 307, USING topo
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard z GEO. MAP COAL NAME: Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, abandoned, 2 years old
SAMPLE CONDITION: dry, faced-up
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 20.9, SAMPLE 20.9, COAL ONLY 20.9
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	49.21	Sandstone, light- to dark-gray; coarse-grained at base, fines upward; large-scale trough crossbedding; lag gravel up to 0.2 m thick at base.
N	0.26	Siltstone, dark-gray to black, pyritic, laminated, carbonaceous, nonfossiliferous; locally cut out by sandstone.
N	0.20	Siltstone, very carbonaceous, laminated, pyritic (approaches cannel).
Y	0.33	Canneloid coal, hard, brittle, nonlaminated, with conchoidal fracture.
Y	0.39	Durain, highly argillaceous, coarsely laminated, slightly pyritic.
Y	0.52	Clarain, with durain, scattered thin-banded vitrain.
Y	0.49	Clarain, with abundant thin- to medium-banded vitrain.
N	1.15	Claystone, light-gray, plastic, rooted.
N	1.97	Siltstone, light-gray, rooted.
N	0.36	Siderite nodules, well cemented; turns to rubble upon weathering.
		See KGS 306 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: L05190 FIELD NO: KGS 307 U.S.G.S. NO: W209905
LABORATORY: USBM REPORT DATE: Dec/10/1980

AIR DRIED LOSS: 2.60%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	4.20%		
VOLATILE MATTER	31.50%	32.88%	42.68%
FIXED CARBON	42.30%	44.15%	57.32%
ASH	22.00%	22.96%	
ULTIMATE ANALYSIS:			
HYDROGEN	4.60%	4.31%	5.60%
CARBON	57.70%	60.23%	78.18%
NITROGEN	1.10%	1.15%	1.49%
TOTAL SULFUR	2.90%	3.03%	3.93%
OXYGEN	11.70%	8.32%	10.80%
ASH	22.00%	22.96%	
HEATING VALUE (BTU/LB):	10393	10848	14083
SULFUR FORMS:			
SULFATE	0.12%	0.13%	0.16%
PYRITIC	2.51%	2.62%	3.40%
ORGANIC	0.31%	0.32%	0.42%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2480 deg F
SOFTENING TEMP.	2580 deg F
FLUID TEMP.	2690 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	5.6

COAL SAMPLING REPORT

LABORATORY NO: LO5171 FIELD NO: KGS 319 U.S.G.S. NO: W210025
SAMPLER: Currens AGENCY: KGS DATE: Apr/01/1980
7.5' QUAD: Isonville COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 21 ROW S TIER 77 2450 FT FSL, 4400 FT FEL
LATITUDE: 38 DEG 0 MIN 24 SEC - LONGITUDE: 83 DEG 5 MIN 55 SEC
ELEVATION (FT): 1131.30, OF POINT AT base of 319, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: Laurel GEO. MAP COAL NAME: Laurel
REPORTED COAL NAME: Laurel rider FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): rider
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: slightly weathered, damp
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 16.9, SAMPLE 16.1, COAL ONLY 16.1
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	6.56	Siltstone, light-gray, slightly weathered.
Y	0.33	Clarain, with scattered thin-banded vitrain; pyritic, slightly weathered.
N	0.07	Siltstone, very carbonaceous, soft (weathered fusain?).
Y	0.16	Durain.
Y	0.85	Clarain, with abundant medium-banded vitrain.
N	0.98	Siltstone, rooted.
N	14.76	Siltstone, medium- to dark-gray; flint clay marker at top.

COAL ANALYSIS REPORT

LABORATORY NO: L05171 FIELD NO: KGS 319 U.S.G.S. NO: W210025
LABORATORY: USBM REPORT DATE: Dec/04/1980

AIR DRIED LOSS: 3.60%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	5.20%		
VOLATILE MATTER	34.90%	36.82%	43.57%
FIXED CARBON	45.20%	47.68%	56.43%
ASH	14.70%	15.51%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.10%	4.77%	5.64%
CARBON	62.60%	66.04%	78.15%
NITROGEN	1.30%	1.37%	1.62%
TOTAL SULFUR	3.10%	3.27%	3.87%
OXYGEN	13.20%	9.04%	10.72%
ASH	14.70%	15.51%	
HEATING VALUE (BTU/LB):	11388	12013	14217
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	2.24%	2.36%	2.80%
ORGANIC	0.81%	0.85%	1.01%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2150 deg F
SOFTENING TEMP.	2280 deg F
FLUID TEMP.	2420 deg F

FREE SWELLING INDEX	2.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	5.4

COAL SAMPLING REPORT

LABORATORY NO: U10086 FIELD NO: KGS 325 U.S.G.S. NO: W210151
SAMPLER: Currens AGENCY: KGS DATE: Apr/08/1980
7.5' QUAD: Zachariah COUNTY: Wolfe DISTRICT: Licking River
CARTER COORDINATE: SEC 15 ROW 0 TIER 71 1950 FT FSL, 3100 FT FEL
LATITUDE: 37 DEG 42 MIN 19 SEC LONGITUDE: 83 DEG 39 MIN 39 SEC
ELEVATION (FT): 1120.00, OF POINT AT base of 325, USING topo
COMMENTARY:
REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Zachariah
REPORTED COAL NAME: Zachariah FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, prospect; CONDITION, 6 to 12 months old
SAMPLE CONDITION: weathered, wet, muddy
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 22.0, SAMPLE 19.3, COAL ONLY 19.3
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	10.00	Siltstone, interbedded with thin sandstone, weathered.
Y	0.39	Coal, weathered.
N	0.23	Siltstone, dark-gray to black, with coaly streaks; plastic when wet.
Y	1.21	Coal, obscured; weathered at top, primarily clarain at base.
N		Siltstone, dark-gray, plastic, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: U10086 FIELD NO: KGS 325 U.S.G.S. NO: W210151
LABORATORY: Geo Test REPORT DATE: Nov/20/1981

AIR DRIED LOSS: 2.74%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	6.09%		
VOLATILE MATTER	36.31%	38.66%	40.12%
FIXED CARBON	54.20%	57.71%	59.89%
ASH	3.40%	3.62%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.50%	5.13%	5.32%
CARBON	71.36%	75.98%	78.85%
NITROGEN	1.92%	2.04%	2.12%
TOTAL SULFUR	1.38%	1.47%	1.52%
OXYGEN	16.44%	11.76%	12.19%
ASH	3.40%	3.62%	
HEATING VALUE (BTU/LB):	12487	13296	13797
SULFUR FORMS:			
SULFATE	0.05%	0.05%	0.06%
PYRITIC	0.29%	0.31%	0.32%
ORGANIC	1.04%	1.11%	1.15%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2140 deg F
SOFTENING TEMP.	2260 deg F
FLUID TEMP.	2340 deg F

FREE SWELLING INDEX	2.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	2.2

COAL SAMPLING REPORT

LABORATORY NO: U10094 FIELD NO: KGS 336 U.S.G.S. NO: W210159
SAMPLER: Currens AGENCY: KGS DATE: May/06/1980
7.5' QUAD: Guage COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 13 ROW N TIER 77 650 FT FSL, 2550 FT FEL
LATITUDE: 37 DEG 37 MIN 6 SEC LONGITUDE: 83 DEG 7 MIN 32 SEC
ELEVATION (FT): 1245.00, OF POINT AT base of 336, USING topo
COMMENTARY:
REGIONAL COAL NAME: Richardson zone GEO. MAP COAL NAME: Skyline
REPORTED COAL NAME: Skyline FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, clean, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 33.9, SAMPLE 25.2, COAL ONLY 25.2
STRUCTURAL FEATURE: , SEPARATION:
STRIKE AZIMUTHS: SET 1 , SET 2 , SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	25.59	Siltstone, light-gray; top 4 feet rooted; arenaceous and crossbedded at base; micaceous, sideritic, with abundant plant fragments.
Y	0.85	Clarain, with scattered medium-banded vitrain.
N	0.26	Siltstone, black, carbonaceous, laminated.
Y	0.26	Clarain, with abundant thick-banded vitrain, pyritic.
Y	0.10	Durain.
Y	0.39	Clarain.
N	0.20	Claystone, slickensided, carbonaceous, with sandstone lenses.
N	0.26	Ironstone, arenaceous.
Y	0.49	Durain, interbedded with clarain, highly argillaceous.
N		Claystone, medium-gray, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: U10094 FIELD NO: KGS 336 U.S.G.S. NO: W210159
LABORATORY: Geo Test REPORT DATE: Nov/20/1981

AIR DRIED LOSS: 1.83%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.67%		
VOLATILE MATTER	35.70%	37.06%	42.49%
FIXED CARBON	48.33%	50.17%	57.52%
ASH	12.30%	12.77%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.08%	4.85%	5.56%
CARBON	68.11%	70.70%	81.06%
NITROGEN	1.49%	1.55%	1.77%
TOTAL SULFUR	0.99%	1.03%	1.18%
OXYGEN	12.03%	9.10%	10.43%
ASH	12.30%	12.77%	
HEATING VALUE (BTU/LB):	12064	12524	14357
SULFUR FORMS:			
SULFATE	0.05%	0.05%	0.06%
PYRITIC	0.35%	0.36%	0.42%
ORGANIC	0.59%	0.61%	0.70%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2780 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.6

COAL SAMPLING REPORT

LABORATORY NO: U10019 FIELD NO: KGS 337 U.S.G.S. NO: W210160
SAMPLER: Currens AGENCY: KGS DATE: May/06/1980
7.5' QUAD: Tiptop COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 18 ROW N TIER 77 5500 FT FSL, 1800 FT FEL
LATITUDE: 37 DEG 36 MIN 54 SEC LONGITUDE: 83 DEG 7 MIN 22 SEC
ELEVATION (FT): 1270.00, OF POINT AT base of 337, USING topo
COMMENTARY:
REGIONAL COAL NAME: Richardson zone GEO. MAP COAL NAME: Skyline
REPORTED COAL NAME: Skyline FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): middle split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 37.6, SAMPLE 37.6, COAL ONLY 37.6
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 130, SET 2 250, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	9.84	Sandstone, crossbedded.
N	4.92	Siltstone, dark-gray.
Y	1.18	Clarain, with abundant medium-banded vitrain.
Y	0.62	Durain, with scattered medium- to thick-banded vitrain.
Y	0.23	Clarain, with abundant thin-banded vitrain.
Y	0.10	Durain, with thick-banded vitrain.
Y	0.03	Fusain.
Y	0.56	Clarain, with abundant thin-banded vitrain.
Y	0.02	Fusain.
Y	0.39	Clarain.
		See KGS 336 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: U10019 FIELD NO: KGS 337 U.S.G.S. NO: W210160
LABORATORY: Geo Test REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 3.25%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	5.85%		
VOLATILE MATTER	33.58%	35.67%	39.58%
FIXED CARBON	51.27%	54.45%	60.43%
ASH	9.30%	9.88%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.35%	4.99%	5.53%
CARBON	69.79%	74.12%	82.25%
NITROGEN	1.44%	1.53%	1.70%
TOTAL SULFUR	0.68%	0.72%	0.80%
OXYGEN	13.44%	8.76%	9.72%
ASH	9.30%	9.88%	
HEATING VALUE (BTU/LB):	12185	12942	14361
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.02%	0.02%	0.02%
ORGANIC	0.65%	0.69%	0.77%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2770 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.1

COAL SAMPLING REPORT

LABORATORY NO: U10066 FIELD NO: KGS 309 U.S.G.S. NO: W210292
SAMPLER: Currens AGENCY: KGS DATE: Mar/25/1980
7.5' QUAD: Isonville COUNTY: Elliott DISTRICT: Licking River
CARTER COORDINATE: SEC 19 ROW S TIER 77 4700 FT FSL, 1800 FT FEL
LATITUDE: 38 DEG 1 MIN 46 SEC LONGITUDE: 83 DEG 6 MIN 22 SEC
ELEVATION (FT): 978.50, OF POINT AT base of 309, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard zone GEO. MAP COAL NAME: Mudseam
REPORTED COAL NAME: Lower Mudseam FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh
RECOVERY METHOD: channel SAMPLING REGIME: Swanson & Huffman
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 33.8, SAMPLE 22.4, COAL ONLY 22.4
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 50, SET 2 310, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 308.
N	16.40	Siltstone, medium-gray, sideritic; rooted at top.
N	0.16	Clarain.
N	0.20	Siltstone, dark-gray.
N	0.16	Clarain.
N	0.46	Siltstone, dark-gray.
Y	0.26	Clarain, with scattered medium-banded vitrain (KGS 310, composited with KGS 309).
N	0.95	Siltstone, dark-gray, soft, rooted.
Y	1.61	Clarain, with scattered to abundant, thin-banded vitrain, scattered pyritic fusain; lithotypes obscured.
N		Underclay, silty, plastic, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: U10066 FIELD NO: KGS 309 U.S.G.S. NO: W210292
LABORATORY: Geo Test REPORT DATE: Nov/20/1981

AIR DRIED LOSS: 1.76%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	5.04%		
VOLATILE MATTER	36.07%	37.99%	40.06%
FIXED CARBON	53.97%	56.84%	59.94%
ASH	4.92%	5.18%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.48%	5.18%	5.46%
CARBON	73.03%	76.91%	81.11%
NITROGEN	1.50%	1.58%	1.67%
TOTAL SULFUR	1.32%	1.39%	1.47%
OXYGEN	13.75%	9.76%	10.29%
ASH	4.92%	5.18%	
HEATING VALUE (BTU/LB):	13008	13699	14447
SULFUR FORMS:			
SULFATE	0.05%	0.05%	0.06%
PYRITIC	0.57%	0.60%	0.63%
ORGANIC	0.70%	0.74%	0.78%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2590 deg F
SOFTENING TEMP.	2680 deg F
FLUID TEMP.	2780 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	2.0

COAL SAMPLING REPORT

LABORATORY NO: U10004 FIELD NO: KGS 373 U.S.G.S. NO: W210432
SAMPLER: Currens AGENCY: KGS DATE: Jun/19/1980
7.5' QUAD: Cannel City COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 15 ROW P TIER 75 3200 FT FSL, 3800 FT FEL
LATITUDE: 37 DEG 47 MIN 32 SEC LONGITUDE: 83 DEG 19 MIN 47 SEC
ELEVATION (FT): 1060.00, OF POINT AT base of 373, USING topo
COMMENTARY:
REGIONAL COAL NAME: Amburgy zone GEO. MAP COAL NAME: Cannel City
REPORTED COAL NAME: Cannel City FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: very fresh, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 37.4, SAMPLE 37.4, COAL ONLY 37.4
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 310, SET 2 220, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	13.12	Siltstone, medium- to light-gray, sideritic, arenaceous, bioturbated.
N	3.61	Siltstone, grading laterally to sandstone, rooted; fine-grained coaly streak at top.
Y	0.43	Clarain, with abundant thin-banded vitrain.
Y	0.07	Durain, highly argillaceous.
Y	1.02	Clarain, with abundant medium- to thick-banded vitrain; pyritic.
Y	0.10	Fusain.
Y	1.51	Clarain, with abundant thin- to medium-banded vitrain.
N	0.98	Siltstone, light-gray, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: U10004 FIELD NO: KGS 373 U.S.G.S. NO: W210432
LABORATORY: Geo Test REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.27%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.27%		
VOLATILE MATTER	37.89%	39.17%	44.18%
FIXED CARBON	47.87%	49.49%	55.82%
ASH	10.97%	11.34%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.18%	4.98%	5.61%
CARBON	68.72%	71.04%	80.13%
NITROGEN	1.89%	1.95%	2.20%
TOTAL SULFUR	3.49%	3.61%	4.07%
OXYGEN	9.75%	7.08%	7.99%
ASH	10.97%	11.34%	
HEATING VALUE (BTU/LB):	12399	12818	14457
SULFUR FORMS:			
SULFATE	0.10%	0.10%	0.12%
PYRITIC	2.29%	2.37%	2.67%
ORGANIC	1.10%	1.14%	1.28%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2020 deg F
SOFTENING TEMP.	2100 deg F
FLUID TEMP.	2260 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	5.6

COAL SAMPLING REPORT

LABORATORY NO: U10022 FIELD NO: KGS 374 U.S.G.S. NO: W210433
SAMPLER: Currens AGENCY: KGS DATE: Jun/19/1980
7.5' QUAD: Cannel City COUNTY: Wolfe DISTRICT: Licking River
CARTER COORDINATE: SEC 11 ROW P TIER 74 1750 FT FSL, 4700 FT FEL
LATITUDE: 37 DEG 47 MIN 17 SEC LONGITUDE: 83 DEG 20 MIN 59 SEC
ELEVATION (FT): 1010.00, OF POINT AT base of 374, USING topo
COMMENTARY: Kentucky Highway 205 improvement near Helechawa
REGIONAL COAL NAME: U Elkhorn No.3 GEO. MAP COAL NAME: Little Caney
REPORTED COAL NAME: Little Caney FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, roadcut; CONDITION, a few weeks old
SAMPLE CONDITION: slightly weathered, faced-up
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 13.4, SAMPLE 13.4, COAL ONLY 13.4
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 130, SET 2 40, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N		Coal (Cannel City).
N	26.25	Siltstone, medium-gray, laminated, sideritic.
Y	1.12	Clarain, with scattered medium-banded vitrain, thin-banded fusain.
N	3.28	Siltstone, light-gray, arenaceous, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: U10022 FIELD NO: KGS 374 U.S.G.S. NO: W210433
LABORATORY: Geo Test REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 1.14%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.72%		
VOLATILE MATTER	39.13%	40.64%	42.57%
FIXED CARBON	52.78%	54.82%	57.42%
ASH	4.37%	4.54%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.53%	5.31%	5.56%
CARBON	74.07%	76.93%	80.59%
NITROGEN	1.82%	1.89%	1.98%
TOTAL SULFUR	2.03%	2.11%	2.21%
OXYGEN	12.18%	9.22%	9.66%
ASH	4.37%	4.54%	
HEATING VALUE (BTU/LB):	13276	13789	14444
SULFUR FORMS:			
SULFATE	0.04%	0.04%	0.04%
PYRITIC	1.13%	1.17%	1.23%
ORGANIC	0.86%	0.89%	0.94%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1960 deg F
SOFTENING TEMP.	2040 deg F
FLUID TEMP.	2080 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	3.1

COAL SAMPLING REPORT

LABORATORY NO: U10119 FIELD NO: KGS 377 U.S.G.S. NO: W210503
SAMPLER: Currens AGENCY: KGS DATE: Jul/10/1980
7.5' QUAD: David COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 25 ROW N TIER 80 4000 FT FSL, 1150 FT FEL
LATITUDE: 37 DEG 35 MIN 40 SEC LONGITUDE: 82 DEG 54 MIN 14 SEC
ELEVATION (FT): 1350.00, OF POINT AT base of 377, USING topo
COMMENTARY:
REGIONAL COAL NAME: Broas zone GEO. MAP COAL NAME: Upper Broas
REPORTED COAL NAME: Upper Broas FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, 2 weeks old
SAMPLE CONDITION: clean, dry, faced-up
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 50.4, SAMPLE 50.4, COAL ONLY 50.4
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 320, SET 2 220, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	32.81	Sandstone, coarse-grained, massive, with swale fills.
N	2.62	Siltstone, rooted, coaly.
N	0.33	Coal.
N	6.56	Sandstone, medium-grained, crossbedded; upper 0.5 m rooted.
Y	2.62	Durain, with scattered thin-banded vitrain.
Y	0.10	Fusain.
Y	1.48	Clarain, with abundant medium-banded vitrain.
N		Siltstone, medium-gray, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: U10119 FIELD NO: KGS 377 U.S.G.S. NO: W210503
LABORATORY: Geo Test REPORT DATE: Dec/08/1981

AIR DRIED LOSS: 0.88%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.55%		
VOLATILE MATTER	35.03%	36.32%	38.41%
FIXED CARBON	56.16%	58.23%	61.59%
ASH	5.26%	5.45%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.27%	5.05%	5.34%
CARBON	74.71%	77.46%	81.93%
NITROGEN	1.53%	1.59%	1.68%
TOTAL SULFUR	0.68%	0.71%	0.75%
OXYGEN	12.55%	9.74%	10.30%
ASH	5.26%	5.45%	
HEATING VALUE (BTU/LB):	13108	13590	14374
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.03%	0.03%	0.03%
ORGANIC	0.64%	0.66%	0.70%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.0

COAL SAMPLING REPORT

LABORATORY NO: U10573 FIELD NO: KGS 382 U.S.G.S. NO: W211194
SAMPLER: Currens AGENCY: KGS DATE: Jul/17/1980
7.5' QUAD: Isonville COUNTY: Elliott DISTRICT: Licking River
CARTER COORDINATE: SEC 20 ROW S TIER 78 1700 FT FSL, 3200 FT FEL
LATITUDE: 38 DEG 1 MIN 17 SEC LONGITUDE: 83 DEG 0 MIN 40 SEC
ELEVATION (FT): 961.00, OF POINT AT base of 382, USING altimeter
COMMENTARY: Barometric elevation not adjusted for atmospheric changes.
REGIONAL COAL NAME: Peach Orchard zone GEO. MAP COAL NAME: Mudseam
REPORTED COAL NAME: Mudseam FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, 3 weeks old
SAMPLE CONDITION: clean, dry, faced-up
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 43.9, SAMPLE 28.2, COAL ONLY 28.2
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 125, SET 2 15, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	6.56	Sandstone, coarse-grained.
N	9.84	Siltstone, medium-gray, laminated to partly bioturbated, sideritic.
Y	0.56	Clarain, with abundant medium-banded vitrain, pyritic.
N	0.56	Siltstone, dark-gray, slickensided, rooted.
Y	0.16	Clarain.
Y	0.13	Durain.
N	0.62	Siltstone, dark-gray, carbonaceous, rooted(?), slickensided.
Y	0.15	Clarain, with abundant thin-banded vitrain.
N	0.13	Siltstone, black, laminated, carbonaceous.
Y	1.35	Clarain, with abundant medium-banded vitrain, scattered thin-banded fusain; pyritic at base.
N	0.98	Siltstone, light-gray, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: U10573 FIELD NO: KGS 382 U.S.G.S. NO: W211194
LABORATORY: Geo Test REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 1.64%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.81%		
VOLATILE MATTER	38.71%	40.24%	43.90%
FIXED CARBON	49.47%	51.43%	56.10%
ASH	8.01%	8.33%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.26%	5.03%	5.48%
CARBON	71.03%	73.84%	80.55%
NITROGEN	1.45%	1.51%	1.64%
TOTAL SULFUR	1.95%	2.03%	2.21%
OXYGEN	12.30%	9.26%	10.12%
ASH	8.01%	8.33%	
HEATING VALUE (BTU/LB):	12954	13467	14690
SULFUR FORMS:			
SULFATE	0.16%	0.17%	0.18%
PYRITIC	0.86%	0.89%	0.98%
ORGANIC	0.93%	0.97%	1.05%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2500 deg F
SOFTENING TEMP.	2560 deg F
FLUID TEMP.	2590 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	3.0

COAL SAMPLING REPORT

LABORATORY NO: U10033 FIELD NO: KGS 383 U.S.G.S. NO: W211624
SAMPLER: Currens AGENCY: KGS DATE: Jul/22/1980
7.5' QUAD: Seitz COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 23 ROW 0 TIER 76 1900 FT FSL, 850 FT FEL
LATITUDE: 37 DEG 40 MIN 19 SEC LONGITUDE: 83 DEG 12 MIN 11 SEC
ELEVATION (FT): 1104.90, OF POINT AT base of 383, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard z GEO. MAP COAL NAME: Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, damp
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 31.3, SAMPLE 27.0, COAL ONLY 26.6
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 310, SET 2 40, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	9.84	Siltstone.
N	0.66	Coal.
N	3.28	Siltstone.
N	8.20	Sandstone.
N	0.66	Coal.
N	13.12	Siltstone, light-gray.
N	0.16	Siltstone or shale, carbonaceous.
N	3.28	Siltstone, light-gray, rooted.
N	0.33	Coal.
N	9.84	Siltstone, medium-gray, arenaceous, sideritic; rooted at top.
Y	0.16	Clarain.
N	0.36	Siltstone, black, carbonaceous, brittle, rooted.
Y	0.30	Durain.
Y	0.23	Clarain.
Y	0.33	Durain.
Y	0.03	Pyrite (lenticular nodule).
Y	1.08	Clarain, with scattered thin- to medium-banded vitrain.
Y	0.02	Fusain.
Y	0.10	Clarain.
N		Siltstone, light-gray, rooted.

COAL ANALYSIS REPORT

LABORATORY NO: U10033 FIELD NO: KGS 383 U.S.G.S. NO: W211624
LABORATORY: Geo Test REPORT DATE: Nov/11/1981

AIR DRIED LOSS: 0.83%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.39%		
VOLATILE MATTER	33.74%	34.92%	41.32%
FIXED CARBON	47.92%	49.60%	58.68%
ASH	14.95%	15.47%	
ULTIMATE ANALYSIS:			
HYDROGEN	4.81%	4.59%	5.43%
CARBON	66.82%	69.17%	81.83%
NITROGEN	1.46%	1.51%	1.79%
TOTAL SULFUR	1.22%	1.26%	1.49%
OXYGEN	10.74%	8.00%	9.46%
ASH	14.95%	15.47%	
HEATING VALUE (BTU/LB):	11727	12139	14361
SULFUR FORMS:			
SULFATE	0.07%	0.07%	0.09%
PYRITIC	0.60%	0.62%	0.73%
ORGANIC	0.55%	0.57%	0.67%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2740 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	2.1

COAL SAMPLING REPORT

LABORATORY NO: U10290 FIELD NO: KGS 504 U.S.G.S. NO: W213950
SAMPLER: Currens AGENCY: KGS DATE: Apr/15/1981
7.5' QUAD: Cannel City COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 10 ROW P TIER 74 1500 FT FSL, 2000 FT FEL
LATITUDE: 37 DEG 48 MIN 15 SEC LONGITUDE: 83 DEG 20 MIN 25 SEC
ELEVATION (FT): 880.00, OF POINT AT base of 504, USING topo
COMMENTARY: Kentucky Highway 205 improvement
REGIONAL COAL NAME: U Elkhorn No.2 GEO. MAP COAL NAME: Grassy
REPORTED COAL NAME: Grassy FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, roadcut; CONDITION, several weeks old
SAMPLE CONDITION: fresh
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 17.7, SAMPLE 17.7, COAL ONLY 17.7
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 320, SET 2 5, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N		Cannel City coal.
N	6.56	Sandstone.
N	16.40	Siltstone, dark-gray, highly sideritic.
N	6.56	Sandstone, light-gray, medium-grained, trough crossbedded.
Y	1.48	Clarain, with abundant medium- to thick-banded vitrain; highly pyritic (pyrite is hard, bright).
N	1.64	Claystone, dark-gray, soft, silty, intensively rooted, carbonaceous

COAL ANALYSIS REPORT

LABORATORY NO: U10290 FIELD NO: KGS 504 U.S.G.S. NO: W213950
LABORATORY: Geo Test REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 1.54%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	4.65%		
VOLATILE MATTER	40.90%	42.90%	44.99%
FIXED CARBON	50.01%	52.45%	55.01%
ASH	4.44%	4.66%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.58%	5.31%	5.57%
CARBON	73.45%	77.03%	80.80%
NITROGEN	1.69%	1.77%	1.86%
TOTAL SULFUR	2.71%	2.84%	2.98%
OXYGEN	12.13%	8.39%	8.79%
ASH	4.44%	4.66%	
HEATING VALUE (BTU/LB):	13163	13805	14479
SULFUR FORMS:			
SULFATE	0.09%	0.09%	0.10%
PYRITIC	1.93%	2.02%	2.12%
ORGANIC	0.69%	0.72%	0.76%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2030 deg F
SOFTENING TEMP.	2140 deg F
FLUID TEMP.	2180 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	4.1

COAL SAMPLING REPORT

LABORATORY NO: U10291 FIELD NO: KGS 505 U.S.G.S. NO: W213951
SAMPLER: Currens AGENCY: KGS DATE: Apr/15/1981
7.5' QUAD: Cannel City COUNTY: Morgan DISTRICT: Licking River
CARTER COORDINATE: SEC 25 ROW Q TIER 75 2000 FT FSL, 2500 FT FEL
LATITUDE: 37 DEG 50 MIN 20 SEC LONGITUDE: 83 DEG 19 MIN 31 SEC
ELEVATION (FT): 900.00, OF POINT AT base of 505, USING topo
COMMENTARY: Kentucky Highway 205 improvement
REGIONAL COAL NAME: Amburgy zone GEO. MAP COAL NAME: Cannel City
REPORTED COAL NAME: Cannel City FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, roadcut; CONDITION, several weeks old
SAMPLE CONDITION: fresh, clean, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 12.6, SAMPLE 12.6, COAL ONLY 12.6
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 315, SET 2 40, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N		Covered.
N	13.12	Siltstone, medium-gray, sideritic, weathered.
N	12.80	Siltstone, light- to dark-gray, fine-grained; sandstone, lenticularly interbedded, carbonaceous.
Y	1.05	Clarain, with abundant medium-banded vitrain, scattered medium- to thick-banded fusain; pyritic.
N	13.12	Sandstone (rooted ganister to 0.3 m), ripple-bedded, flaser-bedded.

COAL ANALYSIS REPORT

LABORATORY NO: U10291 FIELD NO: KGS 505 U.S.G.S. NO: W213951
LABORATORY: Geo Test REPORT DATE: Jan/25/1982

AIR DRIED LOSS: 2.80%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	5.94%		
VOLATILE MATTER	39.04%	41.51%	43.30%
FIXED CARBON	51.12%	54.35%	56.70%
ASH	3.90%	4.15%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.55%	5.19%	5.42%
CARBON	72.98%	77.59%	80.94%
NITROGEN	1.53%	1.63%	1.70%
TOTAL SULFUR	2.83%	3.01%	3.14%
OXYGEN	13.21%	8.43%	8.80%
ASH	3.90%	4.15%	
HEATING VALUE (BTU/LB):	13191	14025	14630
SULFUR FORMS:			
SULFATE	0.16%	0.17%	0.18%
PYRITIC	1.84%	1.96%	2.04%
ORGANIC	0.83%	0.88%	0.92%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1990 deg F
SOFTENING TEMP.	2040 deg F
FLUID TEMP.	2090 deg F

FREE SWELLING INDEX	4.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	4.3

COAL SAMPLING REPORT

LABORATORY NO: U10328 FIELD NO: KGS 530 U.S.G.S. NO: W214266
SAMPLER: Currens AGENCY: KGS DATE: Jun/18/1981
7.5' QUAD: Landsaw COUNTY: Wolfe DISTRICT: Licking River
CARTER COORDINATE: SEC 14 ROW N TIER 73 4500 FT FSL, 1950 FT FEL
LATITUDE: 37 DEG 37 MIN 44 SEC LONGITUDE: 83 DEG 28 MIN 24 SEC
ELEVATION (FT): 960.00, OF POINT AT base of 530, USING topo
COMMENTARY:
REGIONAL COAL NAME: Lower Elkhorn GEO. MAP COAL NAME: Vires
REPORTED COAL NAME: Vires FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, few days old
SAMPLE CONDITION: fresh, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 38.6, SAMPLE 33.5, COAL ONLY 33.3
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 138, SET 2 35, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 531.
N	9.19	Siltstone, arenaceous, sideritic; rooted at top.
N	0.75	Shale, highly carbonaceous (canneloid).
N	27.56	Siltstone, dark- to medium-gray, laminated, sideritic, arenaceous; carbonaceous near base; rooted at top.
Y	0.36	Clarain, with abundant thin-banded vitrain.
Y	0.02	Fusain, pyritic.
Y	0.72	Clarain, with abundant thin-banded vitrain, pyritic.
Y	0.20	Durain.
Y	0.75	Clarain, with abundant thick-banded vitrain.
N	0.43	Siltstone, dark-gray, rooted.
Y	0.02	Clay, black, carbonaceous.
Y	0.72	Clarain, with abundant thick-banded vitrain, scattered thick-banded fusain.
N	0.33	Claystone, medium- to light-gray, rooted, plastic when wet.

COAL ANALYSIS REPORT

LABORATORY NO: U10328 FIELD NO: KGS 530 U.S.G.S. NO: W214266
LABORATORY: Geo Test REPORT DATE: Feb/11/1982

AIR DRIED LOSS: 2.01%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	4.56%		
VOLATILE MATTER	35.43%	37.12%	39.36%
FIXED CARBON	51.30%	53.75%	56.99%
ASH	8.71%	5.68%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.42%	5.14%	5.45%
CARBON	70.96%	74.35%	78.83%
NITROGEN	1.63%	1.71%	1.81%
TOTAL SULFUR	1.63%	1.71%	1.81%
OXYGEN	11.65%	11.41%	12.10%
ASH	8.71%	5.68%	
HEATING VALUE (BTU/LB):	12728	13336	14140
SULFUR FORMS:			
SULFATE	0.06%	0.06%	0.07%
PYRITIC	0.75%	0.79%	0.83%
ORGANIC	0.82%	0.86%	0.91%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2580 deg F
SOFTENING TEMP.	2660 deg F
FLUID TEMP.	2710 deg F

FREE SWELLING INDEX	3.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	2.6

COAL SAMPLING REPORT

LABORATORY NO: U10555 FIELD NO: KGS 573 U.S.G.S. NO: W215418
SAMPLER: Currens AGENCY: KGS DATE: Sep/23/1981
7.5' QUAD: Campton COUNTY: Wolfe DISTRICT: Licking River
CARTER COORDINATE: SEC 1 ROW N TIER 71 5900 FT FSL, 1400 FT FEL
LATITUDE: 37 DEG 39 MIN 58 SEC LONGITUDE: 83 DEG 35 MIN 17 SEC
ELEVATION (FT): 941.00, OF POINT AT base of 573, USING topo
COMMENTARY:
REGIONAL COAL NAME: Manchester GEO. MAP COAL NAME: Zachariah
REPORTED COAL NAME: Zachariah FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): full thickness
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, wet, slightly muddy
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 41.3, SAMPLE 35.4, COAL ONLY 35.4
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 130, SET 2 225, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	9.84	Shale, dark-gray, carbonaceous, sideritic.
N	3.28	Shale, black, laminated, carbonaceous.
Y	1.21	Clarain, predominantly medium- to thick-banded vitrain, scattered thin-banded fusain, pyritic.
N	0.39	Shale, medium-gray, rooted.
Y	0.49	Clarain, with abundant thick-banded vitrain; very hard.
N	0.10	Pyrite, in elongated nodules 2 to 4 cm thick by 30 to 40 cm long.
Y	0.95	Clarain, with predominantly thick-banded vitrain, scattered pyrite nodules to 3 cm diameter; very hard.
Y	0.30	Coal, under water; probably clarain, as above.

COAL ANALYSIS REPORT

LABORATORY NO: U10555 FIELD NO: KGS 573 U.S.G.S. NO: W215418
LABORATORY: Geo Test REPORT DATE: Mar/31/1982

AIR DRIED LOSS: 1.68%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	4.70%		
VOLATILE MATTER	38.06%	39.94%	43.32%
FIXED CARBON	49.79%	52.24%	56.68%
ASH	7.45%	7.82%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.31%	5.02%	5.45%
CARBON	69.08%	72.49%	78.63%
NITROGEN	1.75%	1.84%	1.99%
TOTAL SULFUR	4.05%	4.25%	4.61%
OXYGEN	12.36%	8.58%	9.32%
ASH	7.45%	7.82%	
HEATING VALUE (BTU/LB):	12610	13232	14354
SULFUR FORMS:			
SULFATE	0.11%	0.12%	0.13%
PYRITIC	2.49%	2.61%	2.83%
ORGANIC	1.45%	1.52%	1.65%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2000 deg F
SOFTENING TEMP.	2080 deg F
FLUID TEMP.	2130 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	6.4

COAL SAMPLING REPORT

LABORATORY NO: U10767 FIELD NO: KGS 605 U.S.G.S. NO: W215546
SAMPLER: Currens & Blackburn AGENCY: KGS DATE: Nov/03/1981
7.5' QUAD: Tiptop COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 19 ROW N TIER 78 5800 FT FSL, 400 FT FEL
LATITUDE: 37 DEG 36 MIN 57 SEC LONGITUDE: 83 DEG 1 MIN 5 SEC
ELEVATION (FT): 1017.80, OF POINT AT base of 605, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard z GEO. MAP COAL NAME: Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): bottom split
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, clean, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 33.5, SAMPLE 33.6, COAL ONLY 33.6
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 310, SET 2 210, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 606.
N	4.27	Siltstone, dark-gray, rooted.
N	11.48	Siltstone, dark-gray, laminated, carbonaceous, sideritic; abundant plant fragments at top.
Y	0.72	Canneloid coal, with conchoidal fracture, argillaceous.
Y	0.23	Durain.
Y	0.52	Clarain, with common thin- to medium-banded vitrain, scattered thin-banded fusain.
Y	0.07	Durain, argillaceous.
Y	1.25	Clarain, with abundant thin- to medium-banded vitrain, common medium-banded fusain, scattered pyrite nodules to 3 cm in diameter.
N	0.66	Claystone, light-gray, rooted, soft, carbonaceous, with rootlets.

COAL ANALYSIS REPORT

LABORATORY NO: U10767 FIELD NO: KGS 605 U.S.G.S. NO: W215546
LABORATORY: Geo Test REPORT DATE: May/07/1982

AIR DRIED LOSS: 1.54%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.48%		
VOLATILE MATTER	33.86%	35.08%	40.42%
FIXED CARBON	49.92%	51.72%	59.58%
ASH	12.74%	13.20%	
ULTIMATE ANALYSIS:			
HYDROGEN	4.96%	4.74%	5.46%
CARBON	69.25%	71.75%	82.66%
NITROGEN	1.43%	1.48%	1.71%
TOTAL SULFUR	0.75%	0.78%	0.90%
OXYGEN	10.87%	8.05%	9.27%
ASH	12.74%	13.20%	
HEATING VALUE (BTU/LB):	12235	12677	14604
SULFUR FORMS:			
SULFATE	0.02%	0.02%	0.02%
PYRITIC	0.06%	0.06%	0.07%
ORGANIC	0.67%	0.69%	0.80%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.2

COAL SAMPLING REPORT

LABORATORY NO: U10768 FIELD NO: KGS 606 U.S.G.S. NO: W215547
SAMPLER: Currens & Blackburn AGENCY: KGS DATE: Nov/03/1981
7.5' QUAD: Tiptop COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 12 ROW N TIER 78 50 FT FSL, 600 FT FEL
LATITUDE: 37 DEG 37 MIN 0 SEC LONGITUDE: 83 DEG 1 MIN 7 SEC
ELEVATION (FT): 1093.50, OF POINT AT base of 606, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard z GEO. MAP COAL NAME: Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): second split from bottom
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, clean, dry
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 7.9, SAMPLE 7.9, COAL ONLY 7.9
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 45, SET 2 310, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 607.
N	3.94	Siltstone, medium-gray, rooted.
N	4.59	Siltstone, medium-gray, laminated, sideritic; slightly arenaceous at base.
N	7.55	Sandstone, dark-gray, fine-grained, carbonaceous, crossbedded.
Y	0.66	Clarain, with scattered thin-banded vitrain; grades to durain at top; highly argillaceous, highly pyritic.
		See KGS 605 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: U10768 FIELD NO: KGS 606 U.S.G.S. NO: W215547
LABORATORY: Geo Test REPORT DATE: May/07/1982

AIR DRIED LOSS: 1.67%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.68%		
VOLATILE MATTER	35.00%	36.34%	42.18%
FIXED CARBON	47.98%	49.81%	57.82%
ASH	13.34%	13.85%	
ULTIMATE ANALYSIS:			
HYDROGEN	4.88%	4.64%	5.38%
CARBON	67.05%	69.61%	80.80%
NITROGEN	1.34%	1.39%	1.61%
TOTAL SULFUR	3.33%	3.46%	4.01%
OXYGEN	10.06%	7.05%	8.20%
ASH	13.34%	13.85%	
HEATING VALUE	12062	12523	14536
SULFUR FORMS:			
SULFATE	0.10%	0.10%	0.12%
PYRITIC	2.39%	2.48%	2.88%
ORGANIC	0.84%	0.87%	1.01%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	1900 deg F
SOFTENING TEMP.	2040 deg F
FLUID TEMP.	2120 deg F

FREE SWELLING INDEX	1.5
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	5.5

COAL SAMPLING REPORT

LABORATORY NO: U10769 FIELD NO: KGS 607 U.S.G.S. NO: W215548
SAMPLER: Currens & Blackburn AGENCY: KGS DATE: Nov/03/1981
7.5' QUAD: Tiptop COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 12 ROW N TIER 78 100 FT FSL, 800 FT FEL
LATITUDE: 37 DEG 37 MIN 1 SEC LONGITUDE: 83 DEG 1 MIN 10 SEC
ELEVATION (FT): 1107.40, OF POINT AT base of 607, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard z GEO. MAP COAL NAME: Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): third split from bottom
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: fresh, damp, muddy
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 10.6, SAMPLE 10.6, COAL ONLY 10.6
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 145, SET 2 230, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
		Horizon KGS 608.
N	2.95	Sandstone, fine-grained, argillaceous, micaceous, carbonaceous, intensively rooted at top (ganister).
N	0.49	Clarain.
N	8.43	Siltstone.
N	2.36	Shale, black, carbonaceous; canneloid in lower 0.2 m (0.02 m thick clarain at base); dark-gray and sideritic at top.
N	1.08	Siltstone, very dark-gray, carbonaceous.
Y	0.43	Durain, with common thin-banded vitrain.
Y	0.36	Clarain, with abundant medium-banded vitrain.
Y	0.07	Fusain.
Y	0.03	Clarain.
		See KGS 606 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: U10769 FIELD NO: KGS 607 U.S.G.S. NO: W215548
LABORATORY: Geo Test REPORT DATE: May/07/1982

AIR DRIED LOSS: 2.24%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	4.62%		
VOLATILE MATTER	38.51%	40.37%	41.85%
FIXED CARBON	53.51%	56.10%	58.15%
ASH	3.36%	3.52%	
ULTIMATE ANALYSIS:			
HYDROGEN	5.66%	5.39%	5.59%
CARBON	76.55%	80.26%	83.19%
NITROGEN	1.58%	1.66%	1.72%
TOTAL SULFUR	0.75%	0.79%	0.82%
OXYGEN	12.10%	8.38%	8.68%
ASH	3.36%	3.52%	
HEATING VALUE (BTU/LB):	13718	14382	14907
SULFUR FORMS:			
SULFATE	0.01%	0.01%	0.01%
PYRITIC	0.07%	0.07%	0.08%
ORGANIC	0.67%	0.70%	0.73%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2800 deg F
SOFTENING TEMP.	2800 deg F
FLUID TEMP.	2800 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	1.1

COAL SAMPLING REPORT

LABORATORY NO: U10770 FIELD NO: KGS 608 U.S.G.S. NO: W215549
SAMPLER: Currens & Blackburn AGENCY: KGS DATE: Nov/03/1981
7.5' QUAD: Tiptop COUNTY: Magoffin DISTRICT: Licking River
CARTER COORDINATE: SEC 12 ROW N TIER 78 550 FT FSL, 800 FT FEL
LATITUDE: 37 DEG 37 MIN 5 SEC LONGITUDE: 83 DEG 1 MIN 10 SEC
ELEVATION (FT): 1129.00, OF POINT AT base of 608, USING altimeter
COMMENTARY:
REGIONAL COAL NAME: Peach Orchard z GEO. MAP COAL NAME: Peach Orchard
REPORTED COAL NAME: Peach Orchard FORMATION OR MEMBER: Breathitt
RANGE SAMPLED (SPLITS, BENCHES, ETC.): fourth split from bottom
EXPOSURE: TYPE, surface mine; CONDITION, active
SAMPLE CONDITION: slightly weathered, clay in cleat
RECOVERY METHOD: channel SAMPLING REGIME: Holmes
SAMPLE SIZE (CORE DIA., CHANNEL SIZE, OR LBS.): 3 x 3 in.
THICKNESS (INCHES): SEAM HEIGHT 11.0, SAMPLE 9.8, COAL ONLY 9.8
STRUCTURAL FEATURE: cleat, SEPARATION:
STRIKE AZIMUTHS: SET 1 335, SET 2 270, SET 3

THE MEASURED SECTION IS REPORTED IN FEET

STRATIGRAPHIC SECTION

IN SAMPLE?	THICKNESS	DESCRIPTION
N	9.84	Shale, dark-gray, silty, sideritic; weathered at top.
Y	0.36	Clarain, with abundant medium-banded vitrain, pyritic.
N	0.10	Shale, black, carbonaceous (thickness varies locally).
Y	0.46	Clarain, with abundant thin- to medium-banded vitrain, scattered thin-banded fusain.
		See KGS 607 for underlying strata.

COAL ANALYSIS REPORT

LABORATORY NO: U10770 FIELD NO: KGS 608 U.S.G.S. NO: W215549
LABORATORY: Geo Test REPORT DATE: May/07/1982

AIR DRIED LOSS: 1.51%

	AS RECEIVED	MOISTURE FREE	MOISTURE/ASH FREE
PROXIMATE ANALYSIS:			
TOTAL MOISTURE	3.40%		
VOLATILE MATTER	35.78%	37.04%	45.41%
FIXED CARBON	43.01%	44.52%	54.59%
ASH	17.81%	18.44%	
ULTIMATE ANALYSIS:			
HYDROGEN	4.88%	4.66%	5.71%
CARBON	63.05%	65.27%	80.02%
NITROGEN	1.22%	1.26%	1.55%
TOTAL SULFUR	3.68%	3.81%	4.67%
OXYGEN	9.36%	6.56%	8.05%
ASH	17.81%	18.44%	
HEATING VALUE (BTU/LB):	11394	11795	14461
SULFUR FORMS:			
SULFATE	0.05%	0.05%	0.06%
PYRITIC	2.43%	2.52%	3.08%
ORGANIC	1.20%	1.24%	1.52%

ASH FUSION TEMPERATURE (REDUCING ATMOSPHERE)

INITIAL DEFORMATION	2220 deg F
SOFTENING TEMP.	2350 deg F
FLUID TEMP.	2400 deg F

FREE SWELLING INDEX	3.0
POUNDS OF SULFUR DIOXIDE PER MILLION BTU	6.5

Table 1.--Descriptions and Locations for 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky.

Sample No.	Field No.	County	Latitude	Longitude	Formation	Coal Bed	Estimated Rank	Sample Thickness (inches)
W210025	KGS 319	Morgan	380024n	830555w	Breathitt	Laurel Rider	High Volatile B Bit	16.1 *
W209873	KGS 302	Morgan	380013n	830329w	Breathitt	Laurel	High Volatile C Bit	32.3 ***
W210159	KGS 336	Magoffin	373706n	830732w	Breathitt	Skyline	High Volatile B Bit	25.2
W210160	KGS 337	Magoffin	373654n	830723w	Breathitt	Skyline	High Volatile B Bit	37.6 *
W210503	KGS 377	Magoffin	373540n	825414w	Breathitt	Upper Broas	High Volatile B Bit	50.4
W209662	KGS 149	Magoffin	373754n	825701w	Breathitt	Broas	High Volatile A Bit	44.3
W209663	KGS 163	Magoffin	373759n	825659w	Breathitt	Broas	High Volatile A Bit	41.1
W209900	KGS 317	Magoffin	374036n	830334w	Breathitt	Peach Orchard Rider	High Volatile A Bit	8.3
W209664	KGS 164	Magoffin	373933n	825928w	Breathitt	Peach Orchard	High Volatile A Bit	10.4
W209665	KGS 165	Magoffin	373933n	825928w	Breathitt	Peach Orchard	High Volatile A Bit	16.1
W209902	KGS 166	Magoffin	373933n	825928w	Breathitt	Peach Orchard	High Volatile A Bit	8.7
W209666	KGS 167	Magoffin	373932n	825931w	Breathitt	Peach Orchard	High Volatile A Bit	23.2
W209898	KGS 315	Magoffin	374040n	830325w	Breathitt	Peach Orchard	High Volatile B Bit	11.4 **
W209899	KGS 316	Magoffin	374040n	830325w	Breathitt	Peach Orchard	High Volatile B Bit	24.4 *
W211624	KGS 383	Magoffin	374019n	831211w	Breathitt	Peach Orchard	High Volatile A Bit	27.0
W215546	KGS 605	Magoffin	373657n	830105w	Breathitt	Peach Orchard	High Volatile A Bit	33.6
W215547	KGS 606	Magoffin	373700n	830107w	Breathitt	Peach Orchard	High Volatile A Bit	7.9
W215548	KGS 607	Magoffin	373701n	830110w	Breathitt	Peach Orchard	High Volatile A Bit	10.6
W215549	KGS 608	Magoffin	373705n	830110w	Breathitt	Peach Orchard	High Volatile A Bit	9.8
W209905	KGS 307	Morgan	375102n	831115w	Breathitt	Peach Orchard	High Volatile B Bit	20.9 **
W207115	KGS 101	Elliott	380417n	830634w	Breathitt	Sebastian	High Volatile B Bit	45.5 **
W209872	KGS 301	Morgan	380011n	830329w	Breathitt	Sebastian	High Volatile B Bit	18.1 **
W209870	KGS 299	Morgan	380010n	830343w	Breathitt	Mudseam	High Volatile B Bit	19.7 *
W209871	KGS 300	Morgan	380010n	830343w	Breathitt	Mudseam	High Volatile B Bit	8.1
W209894	KGS 308	Elliott	380144n	830624w	Breathitt	Mudseam	High Volatile B Bit	11.2
W210292	KGS 309	Elliott	380146n	830622w	Breathitt	Mudseam	High Volatile B Bit	22.4 *
W211194	KGS 382	Elliott	380117n	830040w	Breathitt	Mudseam	High Volatile A Bit	28.2
W209853	KGS 298	Magoffin	373323n	825650w	Breathitt	Hazard	High Volatile A Bit	45.9
W209903	KGS 305	Morgan	375101n	831106w	Breathitt	Prater	High Volatile B Bit	19.3 *
W209904	KGS 306	Morgan	375104n	831105w	Breathitt	Prater	High Volatile B Bit	4.3 *

Table 1.--Descriptions and Locations for 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

Sample No.	Field No.	County	Latitude	Longitude	Formation	Coal Bed	Estimated Rank	Sample Thickness (inches)
W209850	KGS 295	Magoffin	374322n	825907w	Breathitt	Fire Clay	High Volatile B Bit	15.3
W210432	KGS 373	Morgan	374732n	831947w	Breathitt	Cannel City	High Volatile A Bit	37.4
W213951	KGS 505	Morgan	375020n	831931w	Breathitt	Cannel City	High Volatile B Bit	12.6 *
W210433	KGS 374	Wolfe	374717n	832059w	Breathitt	Little Caney	High Volatile B Bit	13.4 *
W203632	KGS 6	Morgan	375609n	825954w	Breathitt	Van Lear	High Volatile A Bit	27.2
W203633	KGS 8	Morgan	375702n	825933w	Breathitt	Van Lear	High Volatile B Bit	22.8 **
W209901	KGS 318	Wolfe	374404n	833336w	Breathitt	Grassy	High Volatile B Bit	8.1 **
W213950	KGS 504	Morgan	374815n	832025w	Breathitt	Grassy	High Volatile B Bit	17.7 *
W214266	KGS 530	Wolfe	373744n	832824w	Breathitt	Vires	High Volatile A Bit	33.5
W210151	KGS 325	Wolfe	374219n	833939w	Breathitt	Zachariah	High Volatile C Bit	19.3 ***
W215418	KGS 573	Wolfe	373958n	833517w	Breathitt	Zachariah	High Volatile B Bit	35.4 *

* This sample is slightly weathered.
** This sample is weathered.
*** This sample is highly weathered and the rank is believed to be higher than calculated.

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky.

[Values in percent or parts-per-million. Coal ashed at 525°C. L means less than the value shown; H, interference for an element which cannot be resolved by any routine method; G, greater than; B, not determined; S, after element title, indicates determinations by automatic plate reading computer assisted, emission spectographic analyses. The standard deviation of any single answer should be taken as plus 50% and minus 35%. Sample number is laboratory number.]

SAMPLE NUMBER	ASH (PERCENT)	SiO_2 (PERCENT)	Al_2O_3 (PERCENT)	CAO (PERCENT)	MGO (PERCENT)	Na_2O (PERCENT)	K_2O (PERCENT)	Fe_2O_3 (PERCENT)	TiO_2 (PERCENT)	P_2O_5 (PERCENT)	SAMPLE NUMBER
W203632	4.1	15	10	2.6	.32	.40	.18	64	.69	.12L	W203632
W203633	1.0	31	25	10	2.0	1.1	.84	7.1	1.0	.50L	W203633
W207115	13.8	47	25	.81	.86	.19	2.5	19	1.4	.04L	W207115
W209662	7.4	53	32	.97	.81	.23	3.0	6.1	1.3	.14L	W209662
W209663	12.0	58	31	.63	.75	.20	2.8	2.2	1.6	.15	W209663
W209664	13.3	50	27	.73	.78	.15	2.3	15	1.2	.08L	W209664
W209665	8.7	55	29	1.1	1.3	.26	3.2	4.5	1.0	.39	W209665
W209666	13.6	54	33	.69	.63	.20	3.2	4.1	1.5	.11	W209666
W209850	57.5	56	36	.29	.78	.18	2.0	2.0	1.7	.02L	W209850
W209853	13.8	56	30	.87	.63	.24	1.6	5.3	2.2	.58	W209853
W209870	11.2	56	29	.84	.81	.10	2.4	5.6	1.5	.09L	W209870
W209871	13.7	56	34	.48	.55	.06	1.5	1.9	1.7	.07L	W209871
W209872	28.9	53	32	.35	.51	.13	2.2	5.5	1.7	.04	W209872
W209873	14.9	48	25	.99	1.1	.13	2.7	16	1.0	.28	W209873
W209894	12.2	36	19	.64	.51	.09	1.9	38	.90	.08L	W209894
W209898	4.4	46	29	2.0	1.1	.24	3.1	13	1.1	.23L	W209898
W209899	12.1	55	36	.53	.53	.09	1.3	2.2	2.1	.08L	W209899
W209900	7.6	48	30	1.6	.60	.19	1.4	14	1.2	.13L	W209900
W209901	8.1	48	39	.80	.55	.11	1.7	6.8	.72	.12L	W209901
W209902	17.5	57	30	.74	.88	.15	2.7	5.2	1.2	.22	W209902

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SO_3 (PERCENT)	AG-S PPM	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	CD PPM	CE PPM	CO PPM	CR PPM	SAMPLE NUMBER
W203632	4.0	.77	500	300	85	29	.37	200	63	63	W203632
W203633	16	1.5	2,000	1,200	68	15L	.62	400	410	200	W203633
W207115	1.5	.37	350	540	34	10L	.63	160	64	140	W207115
W209662	.85	1.5	510	610	36	10L	.74	230	86	200	W209662
W209663	.60	.22	600	490	62	10L	.30	160	98	180	W209663
W209664	1.1	.52	410	630	16	10L	.44	220	68	170	W209664
W209665	1.5	.28	520	880	21	10L	.74	320	100	150	W209665
W209666	1.0	.49	370	670	14	10L	.74	210	38	79	W209666
W209850	.42	.10L	110	260	8.6	10L	.34	210	24	88	W209850
W209853	.88	.31	270	470	14	10L	.76	250	41	200	W209853
W209870	1.0	.12	360	540	50	10L	.55	120	100	69	W209870
W209871	.60	.58	400	350	88	10L	1.0	150	75	220	W209871
W209872	.80	.25	290	1,400	11	10L	.49	66	35	75	W209872
W209873	1.8	.35	440	810	23	10	.90	390	65	360	W209873
W209894	1.1	.63	500	350	36	10L	1.2	140	66	120	W209894
W209898	2.3	2.0	1,100	670	150	10L	1.3	160	77	210	W209898
W209899	.60	.34	400	430	13	10L	.37	180	49	230	W209899
W209900	1.7	1.6	510	540	44	10L	1.1	170	41	160	W209900
W209901	.80	.70	520	440	52	10L	1.3	220	260	240	W209901
W209902	.70	.29	280	710	14	10L	.34	220	49	180	W209902

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	HO-S PPM	SAMPLE NUMBER
W203632	4.9L	180	22L	10L	4.1	78	23	60	4.9	6.8L	W203632
W203633	20L	950	22L	18	12	140	44	43	10	15L	W203633
W207115	8.7	86	22L	10L	3.0	67	15L	59	5.1	6.8L	W207115
W209662	12	290	22L	10L	4.7	50	15L	34	5.4	6.8L	W209662
W209663	13	150	22L	10L	3.2	42	15L	40	6.7	6.8L	W209663
W209664	12	210	54	17	5.1	49	15L	9.3	6.0	6.8L	W209664
W209665	8.0	150	35	32L	6.3	41	15L	4.9	4.6	6.8L	W209665
W209666	2.9	270	22L	10L	2.5	49	15L	11	7.4	6.8L	W209666
W209850	8.9	52	22L	10L	2.2	25	15L	2.5	12	6.8L	W209850
W209853	6.3	180	22L	17	4.6	33	25	2.6	9.4	6.8L	W209853
W209870	3.6	150	22L	10L	3.8	57	15L	33	1.8	6.8L	W209870
W209871	8.8	210	22L	15L	3.9	55	15L	60	6.6	6.8L	W209871
W209872	5.2	160	22L	10L	2.3	36	18	6.5	2.8	6.8L	W209872
W209873	17	180	22L	10L	7.4	43	17	46	14	6.8L	W209873
W209894	11	150	22L	10L	2.4	66	15L	130	3.3	6.8L	W209894
W209898	14	830	65	46L	7.5	150	59	160	4.5	68L	W209898
W209899	5.0	190	22L	10L	4.7	46	46L	7.1	8.3	6.8L	W209899
W209900	6.6	390	22L	46L	4.2	45	46L	10	5.3	6.8L	W209900
W209901	6.2	200	22L	46L	6.5	84	46L	27	4.3	15L	W209901
W209902	9.7	120	46L	10L	4.5	48	46L	13	5.7	6.8L	W209902

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	PB PPM	PR-S PPM	SAMPLE NUMBER
W203632	120	62	1.5	320	.0H	16	73	100	220	68L	W203632
W203633	200	200	3.0	300	50	10	190	380	230	110	W203633
W207115	87	260	1.4	120	7.2	12	38	190	79	68L	W207115
W209662	110	140	1.8	140	25	21	160	170	89	68L	W209662
W209663	83	180	1.3	43	5.2	14	100	210	85	68L	W209663
W209664	98	170	2.0	66	37	32	160	170	54	85	W209664
W209665	150	130	2.2	170	18	14	180	140	51	68L	W209665
W209666	110	180	1.9	130	28	26	160	120	85	68L	W209666
W209850	110	250	.9	71	1.0L	22	45	32	77	68L	W209850
W209853	140	250	1.5	48	7.8	34	98	83	110	11	W209853
W209870	45	140	1.5	280	8.6	22	69	240	78	68L	W209870
W209871	73	200	1.3	60	22	44	120	260	94	68L	W209871
W209872	35	310	.6	54	17	40	150	120	100	68L	W209872
W209873	220	110	1.8	1,500	21	18	78	150	130	68L	W209873
W209894	98	86	1.0	110	63	20	120	280	400	68L	W209894
W209898	91	120	5.0	180	100	57	170	440	250	150L	W209898
W209899	120	320	1.2	38	16	39	160	140	88	68L	W209899
W209900	66	280	1.2	77	35	35	150	110	67	150L	W209900
W209901	120	300	1.6	48	47	24	190	410	82	83	W209901
W209902	120	200	1.0	160	2.9	12	120	120	67	68L	W209902

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	RB PPM	SC PPM	SM PPM	SN-S PPM	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	U PPM	SAMPLE NUMBER
W203632	240L	17	17	.0H	840	2.4L	2.9	9.8	120	5.4L	W203632
W203633	710L	42	56	3.1	3,200L	9.1L	9.6	20	3.2L	19L	W203633
W207115	290L	42	14	1.5L	320	3.1	2.5	21	4.6L	11	W207115
W209662	140	50	20	5.1	650	1.5	2.4	30	4.6L	18	W209662
W209663	120	40	13	7.0	420	2.2	.42	29	4.6L	12	W209663
W209664	210	48	18	6.6	670	1.7	3.1	21	4.6L	14	W209664
W209665	230L	44	33	2.0	1,900	1.5	3.6	21	4.6L	6.6	W209665
W209666	150L	25	19	5.4	910	1.2	3.0	21	4.6L	16	W209666
W209850	130	22	16	7.3	120	3.4	4.3	54	4.6L	17	W209850
W209853	160	43	19	6.0	1,000	4.0	5.6	43	4.6L	17	W209853
W209870	360L	25	15	5.5	370	1.2	2.9	8.9	4.6L	2.5L	W209870
W209871	360L	49	14	10	360	2.3	2.4	28	4.6L	22	W209871
W209872	170L	19	9.3	5.9	690	1.0	1.3	12	4.6L	5.7	W209872
W209873	210	71	31	1.5L	350	5.6	3.8	71	4.6L	23	W209873
W209894	410L	47	9.0	.0H	680	.82	19	13	4.6L	6.9	W209894
W209898	910L	130	23	1.5L	790	4.5L	13	34	4.6L	45	W209898
W209899	330L	52	19	12	400	3.6	2.5	36	4.6L	14	W209899
W209900	530L	45	13	3.6	870	1.8	3.9	29	4.6L	14	W209900
W209901	490L	68	30	5.7	580	1.0	8.1	21	4.6L	12	W209901
W209902	340L	39	15	18	1,200	1.9	3.0	22	4.6L	9.5	W209902

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	V-S PPM	W PPM	Y-S PPM	YB PPM	ZN PPM	ZR-S PPM	SAMPLE NUMBER
W203632	74	20	140	9.8	100	160	W203632
W203633	170	160	210	20	470	140	W203633
W207115	130	7.2	30	8.0	200	150	W207115
W209662	260	5.4	90	14	160	160	W209662
W209663	170	4.2	44	10	68	140	W209663
W209664	280	8.3	99	16	260	210	W209664
W209665	220	6.9	91	16	160	120	W209665
W209666	250	5.1	60	15	150	230	W209666
W209850	110	3.0	34	7.8	74	230	W209850
W209853	180	5.3	51	11	250	210	W209853
W209870	190	4.5	63	9.8	120	140	W209870
W209871	280	5.1	84	10	47	320	W209871
W209872	210	2.8	66	4.5	110	400	W209872
W209873	180	6.4	55	14	320	120	W209873
W209894	150	6.6	58	7.4	250	200	W209894
W209898	520	43	260	36	320	390	W209898
W209899	200	6.6	70	9.1	110	310	W209899
W209900	220	9.2	120	11	92	290	W209900
W209901	490	8.6	120	12	100	310	W209901
W209902	190	4.6	57	8.0	83	140	W209902

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	ASH (PERCENT)	SiO_2 (PERCENT)	Al_2O_3 (PERCENT)	CaO (PERCENT)	MgO (PERCENT)	Na_2O (PERCENT)	K_2O (PERCENT)	Fe_2O_3 (PERCENT)	TiO_2 (PERCENT)	P_2O_5 (PERCENT)	SAMPLE NUMBER
W209903	3.3	45	37	2.8	.75	.12	1.0	6.1	.87	.30L	W209903
W209904	22.8	55	29	.41	.88	.16	2.7	8.3	1.3	.16	W209904
W209905	22.4	47	27	.39	.61	.11	1.9	17	1.7	.06	W209905
W210025	15.3	45	22	.52	.70	.08	2.2	24	1.0	.21	W210025
W210151	2.7	34	27	2.3	.90	.09	1.8	25	1.0	.37L	W210151
W210159	11.4	45	33	.71	.81	.19	2.2	9.2	2.2	.09L	W210159
W210160	9.5	58	28	.76	.70	.12	1.9	2.1	2.5	.11L	W210160
W210292	4.9	43	31	1.4	.53	.20	1.6	16	1.0	.20L	W210292
W210432	15.7	38	19	.71	.75	.24	1.9	33	1.1	.06L	W210432
W210433	4.4	21	9.4	3.1	.88	.84	.98	50	.55	.23L	W210433
W210503	5.4	53	33	1.3	.56	.11	1.3	2.6	2.8	.19L	W210503
W211194	8.4	44	27	1.2	.90	.15	2.0	18	1.1	.12L	W211194
W211624	15.5	54	31	1.0	.41	.13	1.3	6.9	2.4	.95	W211624
W213950	4.6	24	12	.73	.50	.84	.92	51	1.1	.22L	W213950
W213951	3.8	16	9.1	2.9	.38	.66	.28	59	.45	.26L	W213951
W214266	8.6	47	30	.81	.88	.31	1.3	12	1.3	.13	W214266
W215418	8.1	28	14	1.1	.56	.16	1.6	48	.67	.12L	W215418
W215546	13.2	63	25	.90	.88	.18	2.1	2.7	2.2	.15	W215546
W215547	13.9	41	19	1.1	.45	.16	1.6	33	1.1	.22	W215547
W215548	3.2	45	34	3.1	.61	.27	1.4	24	.85	1.6	W215548
W215549	18.9	47	22	.85	.68	.26	2.5	9.8	1.3	.16	W215549

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	SO_3 (PERCENT)	AG-S PPM	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	CD PPM	CE PPM	CO PPM	CR PPM	SAMPLE NUMBER
W209903	2.9	.74	1,000	660	120	10L	3.3	270	170	220	W209903
W209904	.57	1.5	270	990	15	10L	.55	210	49	230	W209904
W209905	.67	.52	1,000	520	50	10L	1.7	150	50	160	W209905
W210025	1.0	1.1	320	1,300	53	10L	1.8	180	130	140	W210025
W210151	3.2	3.4	1,000	510	130	10L	3.4	150	160	310	W210151
W210159	1.4	.17	360	420	40	10L	.47	190	130	250	W210159
W210160	1.4	.34	420	520	33	10L	.85	240	90	200	W210160
W210292	1.6	.78	800	390	78	10L	1.0	240	130	280	W210292
W210432	1.6	.45	390	370	16	10L	.32	100	63	88	W210432
W210433	4.3	1.4	400	590	130	10L	.28	160	91	130	W210433
W210503	1.9	.62	600	430	61	10L	.70	300	190	260	W210503
W211194	1.6	.43	1,000	320	77	43	.50	180	92	240	W211194
W211624	.55	.36	300	540	24	10L	.60	260	63	200	W211624
W213950	.90	.80	460	450	99	10L	.60	110	74	85	W213950
W213951	2.6	2.6	310	350	150	10L	.50	53	110	63	W213951
W214266	.67	1.6	400	470	43	10L	.44	270	70	170	W214266
W215418	1.3	.48	460	210	18	10L	.40	86	19	140	W215418
W215546	1.1	.25	280	370	14	10L	.82	210	48	170	W215546
W215547	1.7	.77	280	300	42	10L	.66	120	96	120	W215547
W215548	3.5	1.4	1,000	1,400	130	10L	4.4	590	440	290	W215548
W215549	1.5	.32	270	310	26	10L	.78	110	63	170	W215549

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	HO-S PPM	SAMPLE NUMBER
W209903	6.1	280	57	46L	12	130	53	230	3.0	68L	W209903
W209904	10	190	22L	10L	3.9	58	46L	65	6.1	6.8L	W209904
W209905	6.7	120	22L	10L	2.8	64	46L	100	6.3	6.8L	W209905
W210025	10	190	22L	10L	3.4	52	15L	54	4.2	6.8L	W210025
W210151	9.3	700	60	43	10	130	28	170	3.7	6.8L	W210151
W210159	9.2	160	22L	10L	4.1	58	15L	16	9.6	6.8L	W210159
W210160	4.7	190	28	31	4.4	44	27	19	11	6.8L	W210160
W210292	6.1	210	22L	14	7.6	110	29	100	6.1	6.8L	W210292
W210432	6.4	96	22L	10L	1.9	55	15L	28	6.4	6.8L	W210432
W210433	2.3	230	37	32	3.9	130	31	310	4.5	6.8L	W210433
W210503	5.6	300	22L	17	6.3	50	15L	46	11	6.8L	W210503
W211194	9.5	210	22L	32L	5.4	79	15L	110	6.0	15L	W211194
W211624	7.7	210	22L	10L	4.7	38	15L	17	9.7	6.8L	W211624
W213950	2.2	200	27	10L	5.7	89	17	160	2.2	6.8L	W213950
W213951	5.3L	270	22L	10L	3.7	140	49	230	5.3L	6.8L	W213951
W214266	12	400	22L	10L	6.3	70	15L	94	5.8	6.8L	W214266
W215418	6.2	190	32	10L	2.8	41	27	24	3.7	6.8L	W215418
W215546	3.8	170	22L	10L	4.1	33	15L	74	8.3	6.8L	W215546
W215547	7.2	230	22L	10L	2.9	32	15L	9.5	4.3	6.8L	W215547
W215548	3.1	360	47	33	15	160	23	180	6.2	11	W215548
W215549	9.3	94	22L	10L	2.2	56	30	55	5.0	6.8L	W215549

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	PB PPM	PR-S PPM	SAMPLE NUMBER
W209903	150	160	3.6	350	150	31	300	820	120	81	W209903
W209904	120	200	1.1	120	8.2	21	110	230	110	68L	W209904
W209905	71	170	.7	520	37	20	140	270	140	150L	W209905
W210025	100	87	1.2	77	58	20	74	300	150	68L	W210025
W210151	74	88	4.8	220	130	15	160	1,700	300	110	W210151
W210159	110	180	2.0	620	35	17	120	200	58	68L	W210159
W210160	140	120	1.9	120	12	34	170	150	85	69	W210160
W210292	100	260	1.8	55	49	22	140	710	130	68L	W210292
W210432	64	130	.9	1,600	39	17	46	140	77	91	W210432
W210433	91	38	2.3	720	15	33	97	370	340	68L	W210433
W210503	150	250	2.6	89	20	48	150	270	140	68L	W210503
W211194	95	86	1.9	84	40	26	92	280	150	68L	W211194
W211624	150	290	1.6	54	20	63	89	130	130	68L	W211624
W213950	43	25	2.8	150	110	17	88	200	470	68L	W213950
W213951	26	18	1.8	150	13	20	32L	380	360	68L	W213951
W214266	130	74	1.9	56	43	20	180	220	130	69	W214266
W215418	62	96	1.1	110	67	16	52	200	220	68L	W215418
W215546	110	100	1.3	81	14	37	65	120	89	68L	W215546
W215547	65	72	1.4	73	32	19	62	220	65	68L	W215547
W215548	280	110	5.0	91	55	18	260	500	190	86	W215548
W215549	58	100	.9	120	51	18	43	130	88	68L	W215549

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	RB PPM	SC PPM	SM PPM	SN-S PPM	SR-S PPM	TA PPM	TB PPM	TH PPM	TL-S PPM	U PPM	SAMPLE NUMBER
W209903	910L	80	39	5.4	2,000	2.7	16	24	4.6L	24	W209903
W209904	310L	55	20	7.6	830	1.9	3.1	26	4.6L	16	W209904
W209905	89	31	12	2.7	1,400	2.3	3.5	24	4.6L	21	W209905
W210025	130	29	12	1.5L	1,100	1.6	2.9	23	4.6L	10	W210025
W210151	1,100L	120	33	3.7	740	7.4L	16	26	4.6L	40	W210151
W210159	440L	51	18	5.6	510	3.4	6.1	38	4.6L	16	W210159
W210160	420L	45	17	10	650	4.1	4.1	39	4.6L	11	W210160
W210292	410L	80	31	1.5L	680	1.6	5.5	31	4.6L	18	W210292
W210432	57	28	8.9	.0H	310	2.0	1.3	16	4.6L	8.0	W210432
W210433	450L	79	16	.0H	580	4.5L	4.5	11	4.6L	13	W210433
W210503	740L	62	26	11	670	4.1	4.1	46	4.6L	21	W210503
W211194	360L	58	17	1.5L	1,100	2.0	4.9	25	35	16	W211194
W211624	52	46	19	6.4	1,200	3.5	3.3	38	4.6L	13	W211624
W213950	650L	54	17	.0H	600	2.0L	5.0	11	4.6L	8.3	W213950
W213951	790L	68	11	.0H	840	5.3L	4.7	7.9	4.6L	9.2L	W213951
W214266	350L	64	28	5.2	450	2.3	5.6	43	34	41	W214266
W215418	620L	28	12	.0H	380	2.5L	2.7	16	4.6L	4.0L	W215418
W215546	91	30	17	6.7	390	3.0	2.8	28	4.6L	15	W215546
W215547	220L	27	12	1.5L	430	1.3	3.1	16	4.6L	11	W215547
W215548	630L	130	56	6.4	3,200	2.8L	16	25	4.6L	27	W215548
W215549	120	41	9.0	1.5L	290	1.7	1.9	19	4.6L	37	W215549

Table 2.--Major- and Minor-Oxide and Trace-Element Concentrations in the Laboratory Ash of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	V-S PPM	W PPM	Y-S PPM	YB PPM	ZN PPM	ZR-S PPM	SAMPLE NUMBER
W209903	520	24	350	27	440	380	W209903
W209904	260	1.8	51	7.5	180	180	W209904
W209905	200	3.1	110	6.3	270	360	W209905
W210025	160	4.6	61	8.5	370	180	W210025
W210151	620	52	220	37	490	140	W210151
W210159	310	7.0	81	15	96	160	W210159
W210160	210	6.8	91	14	120	350	W210160
W210292	380	6.1	140	16	530	210	W210292
W210432	170	5.1	36	6.4	130	160	W210432
W210433	190	66	150	16	210	360	W210433
W210503	250	11	120	20	130	430	W210503
W211194	270	4.8	150	13	150	300	W211194
W211624	160	9.4	79	11	88	460	W211624
W213950	140	61	160	20	160	130	W213950
W213951	100	66	160	16	110	92	W213951
W214266	450	14	100	16	140	200	W214266
W215418	190	12	80	8.6	120	190	W215418
W215546	140	8.3	45	9.8	160	410	W215546
W215547	200	9.4	69	11	58	140	W215547
W215548	400	56	200	41	580	190	W215548
W215549	210	4.8	42	6.9	66	140	W215549

Table 3.--Content of 23 Trace Elements in 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky.

[Analysis performed on whole-coal. Values in parts-per-million (ppm). L, less than the value shown; B, not determined.]

SAMPLE NUMBER	AS PPM	CE PPM	CL PPM	CO PPM	CR PPM	CS PPM	EU PPM	F PPM	HF PPM	HG PPM	SAMPLE NUMBER
W203632	39.1	8.0	1,500	2.6	2.6	.2L	.17	39	.2	.17	W203632
W203633	2.6	4.0	940	4.1	2.0	.2L	.12	20L	.1	.010L	W203633
W207115	7.3	22	280	8.9	20	1.2	.42	160	.7	.12	W207115
W209662	8.8	17	1,300	6.4	15	.9	.35	90	.4	.34	W209662
W209663	1.9	19	560	12	21	1.5	.38	50	.8	.055	W209663
W209664	37.0	29	740	9.0	22	1.6	.68	70	.8	.34	W209664
W209665	2.8	28	840	9.0	13	.7	.55	60	.4	.060	W209665
W209666	1.0	29	570	5.2	11	.4	.34	110	1.0	.19	W209666
W209850	7.4	120	250	14	50	5.1	1.3	320	6.8	.15	W209850
W209853	21.9	34	640	5.6	28	.9	.64	40	1.3	.046	W209853
W209870	37.9	13	280	12	7.7	.4	.43	20	.2	.37	W209870
W209871	76.2	21	370	10	31	1.2	.54	70	.9	.66	W209871
W209872	12.7	19	100L	10	22	1.5	.67	70	.8	.37	W209872
W209873	25.8	58	100L	9.8	53	2.6	1.1	200	2.1	.76	W209873
W209894	76.7	17	100L	8.1	14	1.3	.29	20	.4	.25	W209894
W209898	13.8	7.0	150	3.4	9.3	.6	.33	40	.2	.15	W209898
W209899	2.0	22	320	5.9	28	.6	.57	30	1.0	.040	W209899
W209900	11.5	13	530	3.1	13	.5	.32	20L	.4	.16	W209900
W209901	1 .6	18	280	21	20	.5	.53	50	.4	.060	W209901
W209902	18.1	38	290	8.5	32	1.7	.79	120	1.0	.11	W209902

Table 3.--Content of 23 Trace Elements in 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LU PPM	NA PPM	P PPM	RB PPM	SB PPM	SC PPM	SE PPM	SM PPM	TB PPM	SAMPLE NUMBER
W203632	5	.1	120	22L	10L	.30	.68	5.7	.70	.1	W203632
W203633	2	.1L	83	22L	7L	.10	.42	1.7	.55	.1	W203633
W207115	12	.2	190	22L	40L	1.4	5.7	4.0	2.0	.3	W207115
W209662	8	.1	130	44L	10	1.0	3.7	7.5	1.5	.2	W209662
W209663	10	.2	180	79	14	.80	4.8	4.1	1.6	.1	W209663
W209664	13	.3	150	44L	28	2.7	6.4	5.6	2.4	.4	W209664
W209665	13	.2	170	150	20L	.80	3.8	3.3	2.9	.3	W209665
W209666	15	.3	200	66	20L	.70	3.4	2.6	2.6	.4	W209666
W209850	64	.5	750	44L	74	1.8	13	3.9	9.0	2	W209850
W209853	19	.2	250	350	22	.83	5.9	11	2.6	.8	W209853
W209870	5	.2	86	44L	40L	.80	2.8	5.8	1.7	.3	W209870
W209871	10	.2	62	44L	50L	2.8	6.7	7.6	1.9	.3	W209871
W209872	10	.2	280	57	50L	1.3	5.4	8.5	2.7	.4	W209872
W209873	33	.3	140	180	31	1.8	11	13	4.6	.6	W209873
W209894	12	.1	85	44L	50L	1.8	5.8	7.0	1.1	2	W209894
W209898	4	.2	79	44L	40L	3.8	5.9	1.2	1.0	.6	W209898
W209899	14	.2	84	44L	40L	.50	6.3	7.9	2.3	.3	W209899
W209900	5	.1	110	44L	40L	.50	3.4	7.4	1.0	.3	W209900
W209901	10	.1	65	44L	40L	1.4	5.5	9.8	2.4	.7	W209901
W209902	21	.2	190	170	60L	.80	6.8	7.1	2.7	.5	W209902

Table 3.--Content of 23 Trace Elements in 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TH PPM	U PPM	YB PPM
W203632	.4	.22L	.4
W203633	.2	.19L	.2
W207115	2.9	1.5	1.1
W209662	2.2	1.4	1.0
W209663	3.5	1.5	1.2
W209664	2.8	1.9	2.1
W209665	1.8	.57	1.4
W209666	2.9	2.1	2.1
W209850	31	10	4.5
W209853	6.0	2.3	1.6
W209870	1.0	.28L	1.1
W209871	3.8	3.1	1.4
W209872	3.5	1.7	1.3
W209873	11	3.4	2.2
W209894	1.6	.84	.9
W209898	1.5	2.0	1.6
W209899	4.3	1.7	1.1
W209900	2.2	1.1	.8
W209901	1.7	.99	1.0
W209902	3.8	1.7	1.4

Table 3.--Content of 23 Trace Elements in 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	AS PPM	CE PPM	CL PPM	CO PPM	CR PPM	CS PPM	EU PPM	F PPM	HF PPM	HG PPM	SAMPLE NUMBER
W209903	1.5	9.0	220	5.6	7.1	.2	.39	30	.1	.060	W209903
W209904	1 .9	49	100L	11	51	2.3	.88	110	1.4	.16	W209904
W209905	38.7	33	100L	11	37	1.5	.63	70	1.4	.20	W209905
W210025	27.1	27	160	20	21	1.6	.53	90	.7	.080	W210025
W210151	7.5	4.0	340	4.2	8.3	.3	.28	20	.1	.10	W210151
W210159	4.6	22	110	14	28	1.1	.47	40	1.1	.24	W210159
W210160	2.2	23	100L	8.5	19	.5	.42	40	1.1	.26	W210160
W210292	2.9	12	270	6.2	14	.3	.37	40	.3	.14	W210292
W210432	22.1	16	1,100	9.9	14	1.0	.30	10	1.0	.18	W210432
W210433	79.1	7.0	1,300	4.0	5.7	.1	.17	10	.2	.16	W210433
W210503	1.5	16	130	10	14	.3	.34	80	.6	.39	W210503
W211194	45.8	15	560	7.7	20	.8	.45	80	.5	.10	W211194
W211624	25.9	40	460	9.8	31	1.2	.73	160	1.5	.32	W211624
W213950	99.3	5.0	1,400	3.4	3.9	.1	.26	20	.1	.23	W213950
W213951	57.1	2.0	1,500	4.2	2.4	.2L	.14	110	.2L	.050	W213951
W214266	48.0	23	1,200	6.0	15	1.0	.54	140	.5	.19	W214266
W215418	156	7.0	440	1.5	11	.5	.23	60	.3	.14	W215418
W215546	2.6	28	400	6.3	23	.5	.54	40	1.1	.082	W215546
W215547	85.4	16	600	13	17	1.0	.40	70	.6	.17	W215547
W215548	2.0	19	1,100	14	9.4	.1	.47	50	.2	.23	W215548
W215549	174	21	400	12	32	1.8	.41	100	1.0	.44	W215549

Table 3.--Content of 23 Trace Elements in 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	LA PPM	LU PPM	NA PPM	P PPM	RB PPM	SB PPM	SC PPM	SE PPM	SM PPM	TB PPM	SAMPLE NUMBER
W209903	5	.1	30	44L	30L	1.7	2.6	2.2	1.3	.5	W209903
W209904	28	.2	270	160	70L	4.1	13	4.8	4.6	.7	W209904
W209905	16	.2	180	57	20	1.0	6.9	12	2.7	.8	W209905
W210025	16	.2	92	140	20	2.6	4.4	6.0	1.8	.4	W210025
W210151	2	.1	19	44L	30L	2.8	3.3	1.3	.90	.4	W210151
W210159	12	.2	160	44L	50L	.90	5.8	7.2	2.1	.7	W210159
W210160	13	.2	85	44L	40L	1.4	4.3	7.9	1.6	.4	W210160
W210292	5	.1	73	44L	20L	1.2	3.9	3.4	1.5	.3	W210292
W210432	10	.1	280	44L	9	1.9	4.3	3.5	1.4	.2	W210432
W210433	4	.1	270	44L	20L	2.2	3.5	1.5	.70	.2	W210433
W210503	8	.1	43	44L	40L	1.7	3.4	5.7	1.4	.2	W210503
W211194	8	.2	92	44L	30L	1.0	4.8	7.8	1.4	.4	W211194
W211624	23	.3	150	640	8	1.5	7.1	8.4	2.9	.5	W211624
W213950	2	.1	280	44L	30L	1.4	2.5	1.7	.80	.2	W213950
W213951	1	.1	190	44L	30L	1.0	2.6	2.1	.40	.2	W213951
W214266	11	.2	200	48	30L	2.4	5.5	5.0	2.4	.5	W214266
W215418	5	.1	97	44L	50L	2.2	2.3	2.0	1.0	.2	W215418
W215546	14	.2	170	87	12	.90	4.0	5.5	2.2	.4	W215546
W215547	9	.2	170	130	30L	1.8	3.8	9.8	1.6	.4	W215547
W215548	9	.2	64	220	20L	1.0	4.2	3.0	1.8	.5	W215548
W215549	11	.2	360	130	22	1.9	7.8	5.4	1.7	.4	W215549

Table 3.--Content of 23 Trace Elements in 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky--Continued.

SAMPLE NUMBER	TH PPM	U PPM	YB PPM
W209903	.8	.80	.9
W209904	5.9	3.7	1.7
W209905	5.4	4.8	1.4
W210025	3.6	1.5	1.3
W210151	.7	1.1	1.0
W210159	4.4	1.9	1.7
W210160	3.8	1.0	1.3
W210292	1.5	.89	.8
W210432	2.5	1.3	1.0
W210433	.5	.57	.7
W210503	2.5	1.1	1.1
W211194	2.1	1.4	1.1
W211624	5.9	2.0	1.7
W213950	.5	.38	.9
W213951	.3	.35L	.6
W214266	3.7	3.6	1.4
W215418	1.3	.32L	.7
W215546	3.7	2.0	1.3
W215547	2.2	1.6	1.5
W215548	.8	.86	1.3
W215549	3.6	7.0	1.3

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis .

[Values in percent or parts-per-million. 23 elements are from direct determinations on whole coal; all other elements calculated from analyses of ash. S means analysis by emission spectography; L, less than the value shown; H, interference for an element which cannot be resolved by any routine method; B, not determined; G, greater than. Sample number is laboratory sample number.]

SAMPLE NUMBER	SI (PERCENT)	AL (PERCENT)	CA (PERCENT)	MG (PERCENT)	NA (PERCENT)	K (PERCENT)	FE (PERCENT)	TI (PERCENT)	AG-S PPM	AS PPM	SAMPLE NUMBER
W203632	.29	.22	.076	.008	.012	.006	1.8	.017	.032	39	W203632
W203633	.14	.13	.071	.012	.008	.007	.049	.006	.015	2.6	W203633
W207115	3.1	1.8	.080	.072	.019	.29	1.8	.11	.051	7.3	W207115
W209662	1.8	1.3	.051	.036	.013	.18	.31	.056	.11	8.8	W209662
W209663	3.2	2.0	.054	.054	.018	.27	.18	.11	.026	1.9	W209663
W209664	3.1	1.9	.069	.062	.015	.26	1.4	.096	.069	37	W209664
W209665	2.2	1.3	.068	.068	.017	.23	.28	.052	.024	2.8	W209665
W209666	3.4	2.4	.067	.052	.020	.36	.39	.12	.067	1.0	W209666
W209850	15	11	.12	.27	.075	.95	.80	.60	.058L	7.4	W209850
W209853	3.6	2.2	.086	.052	.025	.18	.51	.18	.043	22	W209853
W209870	2.9	1.7	.067	.055	.009	.22	.44	.10	.013	38	W209870
W209871	3.6	2.5	.047	.045	.006	.18	.18	.14	.079	76	W209871
W209872	7.1	4.8	.072	.089	.028	.54	1.1	.30	.072	13	W209872
W209873	3.3	2.0	.11	.10	.014	.34	1.6	.089	.052	26	W209873
W209894	2.1	1.3	.056	.038	.009	.19	3.2	.066	.077	77	W209894
W209898	.94	.66	.063	.029	.008	.12	.39	.028	.088	14	W209898
W209899	3.1	2.3	.046	.039	.008	.14	.19	.15	.041	2.0	W209899
W209900	1.7	1.2	.084	.027	.011	.088	.74	.056	.12	12	W209900
W209901	1.8	1.7	.046	.027	.006	.11	.38	.035	.057	11	W209901
W209902	4.6	2.8	.092	.093	.019	.40	.63	.13	.051	18	W209902

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	BR PPM	CD PPM	CE PPM	CL PPM	CO PPM	CR PPM	SAMPLE NUMBER
W203632	21	12	3	1.2	34	.02	8.0	1,500	2.6	2.6	W203632
W203633	20	12	1	.1L	35	.01	4.0	940	4.1	2.0	W203633
W207115	48	75	5	1.4L	9.5	.09	22	280	8.9	20	W207115
W209662	38	45	3	.7L	5.5	.05	17	1,300	6.4	15	W209662
W209663	72	59	7	1.2L	4.0	.04	19	560	12	21	W209663
W209664	55	84	2	1.3L	13	.06	29	740	9.0	22	W209664
W209665	45	77	2	.9L	14	.06	28	840	9.0	13	W209665
W209666	50	91	2	1.4L	22	.10	29	570	5.2	11	W209666
W209850	63	150	5	5.8L	10	.20	120	250	14	50	W209850
W209853	37	65	2	1.4L	13	.10	34	640	5.6	28	W209853
W209870	40	60	6	1.1L	9.2	.06	13	280	12	7.7	W209870
W209871	55	48	12	1.4L	11	.14	21	370	10	31	W209871
W209872	84	400	3	2.9L	4.5	.14	19	100L	10	22	W209872
W209873	66	120	3	1.5	2.9	.13	58	100L	9.8	53	W209873
W209894	61	43	4	1.2L	5.0	.15	17	100L	8.1	14	W209894
W209898	48	29	7	.4L	7.2	.06	7.0	150	3.4	9.3	W209898
W209899	48	52	2	1.2L	8.6	.04	22	320	5.9	28	W209899
W209900	39	41	3	.8L	9.9	.08	13	530	3.1	13	W209900
W209901	42	36	4	.8L	10	.11	18	280	21	20	W209901
W209902	49	120	2	1.8L	8.3	.06	38	290	8.5	32	W209902

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	F PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	SAMPLE NUMBER
W203632	.2L	7.4	.9L	.4L	.17	39	3.2	.94	2.5	.2	W203632
W203633	.2L	9.4	.2L	.2	.12	20L	1.4	.44	.43	.1	W203633
W207115	1.2	12	3.0L	1.4L	.42	160	9.2	2.1L	8.1	.7	W207115
W209662	.9	21	1.6L	.7L	.35	90	3.7	1.1L	2.5	.4	W209662
W209663	1.5	18	2.6L	1.2L	.38	50	5.0	1.8L	4.8	.8	W209663
W209664	1.6	28	7.2	2.3	.68	70	6.5	2.0L	1.2	.8	W209664
W209665	.7	13	3.0	2.8L	.55	60	3.6	1.3L	.43	.4	W209665
W209666	.4	37	3.0L	1.4L	.34	110	6.7	2.0L	1.5	1.0	W209666
W209850	5.1	30	13L	5.8L	1.3	320	14	8.6L	1.4	6.8	W209850
W209853	.9	25	3.0L	2.3	.64	40	4.6	3.5	.36	1.3	W209853
W209870	.4	17	2.5L	1.1L	.43	20	6.4	1.7L	3.7	.2	W209870
W209871	1.2	29	3.0L	2.1L	.54	70	7.5	2.1L	8.2	.9	W209871
W209872	1.5	46	6.4L	2.9L	.67	70	10	5.2	1.9	.8	W209872
W209873	2.6	27	3.3L	1.5L	1.1	200	6.4	2.5	6.9	2.1	W209873
W209894	1.3	18	2.7L	1.2L	.29	20	8.1	1.8L	16	.4	W209894
W209898	.6	37	2.9	2.0L	.33	40	6.6	2.6	7.0	.2	W209898
W209899	.6	23	2.7L	1.2L	.57	30	5.6	5.6L	.86	1.0	W209899
W209900	.5	30	1.7L	3.5L	.32	20L	3.4	3.5L	.76	.4	W209900
W209901	.5	16	1.8L	3.7L	.53	50	6.8	3.7L	2.2	.4	W209901
W209902	1.7	21	8.1L	1.8L	.79	120	8.4	8.1L	2.3	1.0	W209902

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	HG PPM	HO-S PPM	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	SAMPLE NUMBER
W203632	.17	.28L	5	2.5	.1	13	.00H	.66	3.0	4.1	W203632
W203633	.010L	.15L	2	2.0	.1L	3.0	.50	.10	1.9	3.8	W203633
W207115	.12	.94L	12	36	.2	17	.99	1.7	5.2	26	W207115
W209662	.34	.50L	8	10	.1	10	1.9	1.6	12	13	W209662
W209663	.055	.82L	10	22	.2	5.2	.62	1.7	12	25	W209663
W209664	.34	.90L	13	23	.3	8.8	4.9	4.3	21	23	W209664
W209665	.060	.59L	13	11	.2	15	1.6	1.2	16	12	W209665
W209666	.19	.92L	15	24	.3	18	3.8	3.5	22	16	W209666
W209850	.15	3.9L	64	140	.5	41	.58L	13	26	18	W209850
W209853	.046	.94L	19	34	.2	6.6	1.1	4.7	14	11	W209853
W209870	.37	.76L	5	16	.2	31	.96	2.5	7.7	27	W209870
W209871	.66	.93L	10	27	.2	8.2	3.0	6.0	16	36	W209871
W209872	.37	2.0L	10	90	.2	16	4.9	12	43	35	W209872
W209873	.76	1.0L	33	16	.3	220	3.1	2.7	12	22	W209873
W209894	.25	.83L	12	10	.1	13	7.7	2.4	15	34	W209894
W209898	.15	3.0L	4	5.3	.2	7.9	4.4	2.5	7.5	19	W209898
W209899	.040	.82L	14	39	.2	4.6	1.9	4.7	19	17	W209899
W209900	.16	.52L	5	21	.1	5.9	2.7	2.7	11	8.4	W209900
W209901	.060	1.2L	10	24	.1	3.9	3.8	1.9	15	33	W209901
W209902	.11	1.2L	21	35	.2	28	.51	2.1	21	21	W209902

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	P PPM	PB PPM	PR-S PPM	RB PPM	SB PPM	SC PPM	SE PPM	SM PPM	SN-S PPM	SR-S PPM	SAMPLE NUMBER
W203632	22L	9.0	2.8L	10L	.30	.68	5.7	.70	.00H	34	W203632
W203633	22L	2.3	1.1	7L	.10	.42	1.7	.55	.03	32L	W203633
W207115	22L	11	9.4L	40L	1.4	5.7	4.0	2.0	.21L	44	W207115
W209662	44L	6.6	5.0L	10	1.0	3.7	7.5	1.5	.38	48	W209662
W209663	79	10	8.2L	14	.80	4.8	4.1	1.6	.84	50	W209663
W209664	44L	7.2	11	28	2.7	6.4	5.6	2.4	.88	89	W209664
W209665	150	4.4	5.9L	20L	.80	3.8	3.3	2.9	.17	170	W209665
W209666	66	12	9.2L	20L	.70	3.4	2.6	2.6	.73	120	W209666
W209850	44L	44	39L	74	1.8	13	3.9	9.0	4.2	69	W209850
W209853	350	15	1.5	22	.83	5.9	11	2.6	.83	140	W209853
W209870	44L	8.7	7.6L	40L	.80	2.8	5.8	1.7	.62	41	W209870
W209871	44L	13	9.3L	50L	2.8	6.7	7.6	1.9	1.4	49	W209871
W209872	57	29	20L	50L	1.3	5.4	8.5	2.7	1.7	200	W209872
W209873	180	19	10L	31	1.8	11	13	4.6	.22L	52	W209873
W209894	44L	49	8.3L	50L	1.8	5.8	7.0	1.1	.00H	83	W209894
W209898	44L	11	6.6L	40L	3.8	5.9	1.2	1.0	.07L	35	W209898
W209899	44L	11	8.2L	40L	.50	6.3	7.9	2.3	1.5	48	W209899
W209900	44L	5.1	11L	40L	.50	3.4	7.4	1.0	.27	66	W209900
W209901	44L	6.6	6.7	40L	1.4	5.5	9.8	2.4	.46	47	W209901
W209902	170	12	12L	60L	.80	6.8	7.1	2.7	3.2	210	W209902

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	TA PPM	TB PPM	TH PPM	TL-S PPM	U PPM	V-S PPM	W PPM	Y-S PPM	YB PPM	ZN PPM	SAMPLE NUMBER
W203632	.10L	.12	.40	4.9	.22L	3.0	.80	5.7	.4	4.1	W203632
W203633	.09L	.10	.20	.03L	.19L	1.7	1.6	2.1	.2	4.7	W203633
W207115	.43	.34	2.9	.63L	1.5	18	1.0	4.1	1.1	28	W207115
W209662	.11	.18	2.2	.34L	1.4	19	.40	6.7	1.0	12	W209662
W209663	.26	.05	3.5	.55L	1.5	20	.50	5.3	1.2	8.2	W209663
W209664	.22	.41	2.8	.61L	1.9	37	1.1	13	2.1	35	W209664
W209665	.13	.31	1.8	.40L	.57	19	.60	7.9	1.4	14	W209665
W209666	.16	.41	2.9	.63L	2.1	34	.70	8.2	2.1	20	W209666
W209850	1.9	2.5	31	2.6L	10	63	1.7	20	4.5	43	W209850
W209853	.55	.77	6.0	.63L	2.3	25	.73	7.0	1.6	34	W209853
W209870	.13	.32	1.0	.52L	.28L	21	.50	7.1	1.1	13	W209870
W209871	.32	.33	3.8	.63L	3.1	38	.70	12	1.4	6.4	W209871
W209872	.30	.38	3.5	1.3L	1.7	61	.80	19	1.3	32	W209872
W209873	.83	.57	11	.69L	3.4	27	.95	8.2	2.2	48	W209873
W209894	.10	2.3	1.6	.56L	.84	18	.80	7.1	.9	31	W209894
W209898	.20L	.58	1.5	.20L	2.0	23	1.9	11	1.6	14	W209898
W209899	.44	.30	4.3	.56L	1.7	24	.80	8.5	1.1	13	W209899
W209900	.14	.30	2.2	.35L	1.1	17	.70	9.1	.8	7.0	W209900
W209901	.09	.66	1.7	.37L	.99	40	.70	9.7	1.0	8.1	W209901
W209902	.34	.53	3.8	.81L	1.7	33	.80	10	1.4	15	W209902

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	ZR-S PPM
W203632	6.6
W203633	1.4
W207115	21
W209662	12
W209663	17
W209664	28
W209665	10
W209666	31
W209850	130
W209853	29
W209870	16
W209871	44
W209872	120
W209873	18
W209894	24
W209898	17
W209899	38
W209900	22
W209901	25
W209902	25

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	SI (PERCENT)	AL (PERCENT)	CA (PERCENT)	MG (PERCENT)	NA (PERCENT)	K (PERCENT)	FE (PERCENT)	TI (PERCENT)	AG-S PPM	AS PPM	SAMPLE NUMBER
W209903	.70	.64	.067	.015	.003	.029	.14	.017	.024	1.5	W209903
W209904	5.9	3.5	.067	.12	.027	.51	1.3	.17	.34	11	W209904
W209905	4.9	3.2	.062	.083	.018	.35	2.7	.22	.12	39	W209905
W210025	3.2	1.8	.057	.064	.009	.28	2.6	.095	.17	27	W210025
W210151	.42	.39	.044	.015	.002	.040	.48	.017	.092	7.5	W210151
W210159	2.4	2.0	.058	.056	.016	.21	.73	.15	.019	4.6	W210159
W210160	2.6	1.4	.052	.040	.009	.15	.14	.14	.032	2.2	W210160
W210292	.99	.81	.048	.016	.007	.064	.54	.031	.038	2.9	W210292
W210432	2.8	1.6	.080	.071	.028	.25	3.6	.10	.071	22	W210432
W210433	.42	.22	.099	.023	.027	.036	1.5	.015	.062	79	W210433
W210503	1.3	.93	.051	.018	.004	.058	.099	.091	.033	1.5	W210503
W211194	1.7	1.2	.072	.045	.009	.14	1.1	.057	.036	46	W211194
W211624	3.9	2.5	.11	.039	.015	.16	.75	.22	.056	26	W211624
W213950	.52	.28	.024	.014	.029	.035	1.6	.029	.037	99	W213950
W213951	.29	.18	.078	.009	.019	.009	1.6	.010	.099	57	W213951
W214266	1.9	1.4	.050	.046	.020	.091	.72	.066	.14	48	W214266
W215418	1.1	.61	.065	.028	.010	.11	2.7	.033	.039	160	W215418
W215546	3.9	1.7	.085	.070	.017	.23	.25	.18	.033	2.6	W215546
W215547	2.6	1.4	.11	.037	.017	.19	3.2	.087	.11	85	W215547
W215548	.67	.58	.070	.012	.006	.037	.55	.016	.045	2.0	W215548
W215549	4.1	2.2	.11	.077	.036	.39	1.3	.14	.060	170	W215549

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	B-S PPM	BA-S PPM	BE-S PPM	BI-S PPM	BR PPM	CD PPM	CE PPM	CL PPM	CO PPM	CR PPM	SAMPLE NUMBER
W209903	33	22	4	.3L	9.7	.11	9.0	220	5.6	7.1	W209903
W209904	62	230	3	2.3L	3.6	.13	49	100L	11	51	W209904
W209905	220	120	11	2.2L	3.1	.38	33	100L	11	37	W209905
W210025	49	200	8	1.5L	5.6	.28	27	160	20	21	W210025
W210151	27	14	4	.3L	16	.09	4.0	340	4.2	8.3	W210151
W210159	41	48	5	1.1L	5.2	.05	22	110	14	28	W210159
W210160	40	49	3	1.0L	5.7	.08	23	100L	8.5	19	W210160
W210292	39	19	4	.5L	7.5	.05	12	270	6.2	14	W210292
W210432	61	58	3	1.6L	22	.05	16	1,100	9.9	14	W210432
W210433	18	26	6	.4L	23	.01	7.0	1,300	4.0	5.7	W210433
W210503	32	23	3	.5L	6.6	.04	16	130	10	14	W210503
W211194	84	27	6	3.6	8.2	.04	15	560	7.7	20	W211194
W211624	46	84	4	1.6L	7.0	.09	40	460	9.8	31	W211624
W213950	21	21	5	.5L	31	.03	5.0	1,400	3.4	3.9	W213950
W213951	12	13	6	.4L	22	.02	2.0	1,500	4.2	2.4	W213951
W214266	34	40	4	.9L	31	.04	23	1,200	6.0	15	W214266
W215418	37	17	1	.8L	17	.03	7.0	440	1.5	11	W215418
W215546	37	49	2	1.3L	12	.11	28	400	6.3	23	W215546
W215547	39	42	6	1.4L	9.2	.09	16	600	13	17	W215547
W215548	32	45	4	.3L	14	.14	19	1,100	14	9.4	W215548
W215549	51	59	5	1.9L	6.0	.15	21	400	12	32	W215549

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	CS PPM	CU PPM	DY-S PPM	ER-S PPM	EU PPM	F PPM	GA-S PPM	GD-S PPM	GE-S PPM	HF PPM	SAMPLE NUMBER
W209903	.2	9.2	1.9	1.5L	.39	30	4.3	1.7	7.6	.1	W209903
W209904	2.3	43	5.0L	2.3L	.88	110	13	10L	15	1.4	W209904
W209905	1.5	27	4.9L	2.2L	.63	70	14	10L	22	1.4	W209905
W210025	1.6	29	3.4L	1.5L	.53	90	8.0	2.3L	8.3	.7	W210025
W210151	.3	19	1.6	1.2	.28	20	3.5	.76	4.6	.1	W210151
W210159	1.1	18	2.5L	1.1L	.47	40	6.6	1.7L	1.8	1.1	W210159
W210160	.5	18	2.7	2.9	.42	40	4.2	2.6	1.8	1.1	W210160
W210292	.3	10	1.1L	.7	.37	40	5.4	1.4	4.9	.3	W210292
W210432	1.0	15	3.5L	1.6L	.30	10	8.6	2.4L	4.4	1.0	W210432
W210433	.1	10	1.6	1.4	.17	10	5.7	1.4	14	.2	W210433
W210503	.3	16	1.2L	.9	.34	80	2.7	.81L	2.5	.6	W210503
W211194	.8	18	1.8L	2.7L	.45	80	6.6	1.3L	9.2	.5	W211194
W211624	1.2	33	3.4L	1.6L	.73	160	5.9	2.3L	2.6	1.5	W211624
W213950	.1	9.2	1.2	.5L	.26	20	4.1	.78	7.4	.1	W213950
W213951	.2L	10	.8L	.4L	.14	110	5.3	1.9	8.7	.2L	W213951
W214266	1.0	34	1.9L	.9L	.54	140	6.0	1.3L	8.1	.5	W214266
W215418	.5	15	2.6	.8L	.23	60	3.3	2.2	1.9	.3	W215418
W215546	.5	22	2.9L	1.3L	.54	40	4.4	2.0L	9.8	1.1	W215546
W215547	1.0	32	3.1L	1.4L	.40	70	4.4	2.1L	1.3	.6	W215547
W215548	.1	12	1.5	1.1	.47	50	5.1	.74	5.8	.2	W215548
W215549	1.8	18	4.2L	1.9L	.41	100	11	5.7	10	1.0	W215549

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	HG PPM	HO-S PPM	LA PPM	LI PPM	LU PPM	MN PPM	MO-S PPM	NB-S PPM	ND-S PPM	NI-S PPM	SAMPLE NUMBER
W209903	.060	2.2L	5	5.3	.1	12	5.0	1.0	9.9	27	W209903
W209904	.16	1.6L	28	46	.2	27	1.9	4.8	25	52	W209904
W209905	.20	1.5L	16	38	.2	120	8.3	4.5	31	60	W209905
W210025	.080	1.0L	16	13	.2	12	8.9	3.1	11	46	W210025
W210151	.10	.18L	2	2.4	.1	5.9	3.5	.41	4.3	46	W210151
W210159	.24	.78L	12	21	.2	71	4.0	1.9	14	23	W210159
W210160	.26	.65L	13	11	.2	11	1.1	3.2	16	14	W210160
W210292	.14	.33L	5	13	.1	2.7	2.4	1.1	6.9	35	W210292
W210432	.18	1.1L	10	20	.1	250	6.1	2.7	7.2	22	W210432
W210433	.16	.30L	4	1.7	.1	32	.66	1.5	4.3	16	W210433
W210503	.39	.37L	8	14	.1	4.8	1.1	2.6	8.1	15	W210503
W211194	.10	1.3L	8	7.2	.2	7.1	3.4	2.2	7.7	24	W211194
W211624	.32	1.1L	23	45	.3	8.4	3.1	9.8	14	20	W211624
W213950	.23	.31L	2	1.2	.1	6.9	5.1	.78	4.0	9.2	W213950
W213951	.050	.26L	1	.7	.1	5.7	.49	.76	1.2L	14	W213951
W214266	.19	.58L	11	6.4	.2	4.8	3.7	1.7	15	19	W214266
W215418	.14	.55L	5	7.8	.1	8.9	5.4	1.3	4.2	16	W215418
W215546	.082	.90L	14	13	.2	11	1.8	4.9	8.6	16	W215546
W215547	.17	.95L	9	10	.2	10	4.4	2.6	8.6	31	W215547
W215548	.23	.35	9	3.5	.2	2.9	1.8	.58	8.3	16	W215548
W215549	.44	1.3L	11	19	.2	23	9.6	3.4	8.1	25	W215549

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	P PPM	PB PPM	PR-S PPM	RB PPM	SB PPM	SC PPM	SE PPM	SM PPM	SN-S PPM	SR-S PPM	SAMPLE NUMBER
W209903	44L	4.0	2.7	30L	1.7	2.6	2.2	1.3	.18	66	W209903
W209904	160	25	16L	70L	4.1	13	4.8	4.6	1.7	190	W209904
W209905	57	31	34L	20	1.0	6.9	12	2.7	.60	310	W209905
W210025	140	23	10L	20	2.6	4.4	6.0	1.8	.23L	170	W210025
W210151	44L	8.1	3.0	30L	2.8	3.3	1.3	.90	.10	20	W210151
W210159	44L	6.6	7.8L	50L	.90	5.8	7.2	2.1	.64	58	W210159
W210160	44L	8.1	6.6	40L	1.4	4.3	7.9	1.6	.95	62	W210160
W210292	44L	6.4	3.3L	20L	1.2	3.9	3.4	1.5	.07L	33	W210292
W210432	44L	12	14	9	1.9	4.3	3.5	1.4	.00H	49	W210432
W210433	44L	15	3.0L	20L	2.2	3.5	1.5	.70	.00H	26	W210433
W210503	44L	7.6	3.7L	40L	1.7	3.4	5.7	1.4	.59	36	W210503
W211194	44L	13	5.7L	30L	1.0	4.8	7.8	1.4	.13L	92	W211194
W211624	640	20	11L	8	1.5	7.1	8.4	2.9	.99	190	W211624
W213950	44L	22	3.1L	30L	1.4	2.5	1.7	.80	.00H	28	W213950
W213951	44L	14	2.6L	30L	1.0	2.6	2.1	.40	.00H	32	W213951
W214266	48	11	5.9	30L	2.4	5.5	5.0	2.4	.45	39	W214266
W215418	44L	18	5.5L	50L	2.2	2.3	2.0	1.0	.00H	31	W215418
W215546	87	12	9.0L	12	.90	4.0	5.5	2.2	.88	51	W215546
W215547	130	9.0	9.5L	30L	1.8	3.8	9.8	1.6	.21L	60	W215547
W215548	220	6.1	2.8	20L	1.0	4.2	3.0	1.8	.20	100	W215548
W215549	130	17	13L	22	1.9	7.8	5.4	1.7	.28L	55	W215549

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	TA PPM	TB PPM	TH PPM	TL-S PPM	U PPM	V-S PPM	W PPM	Y-S PPM	YB PPM	ZN PPM	SAMPLE NUMBER
W209903	.09	.53	.80	.15L	.80	17	.80	12	.9	15	W209903
W209904	.44	.70	5.9	1.0L	3.7	59	.40	12	1.7	41	W209904
W209905	.51	.79	5.4	1.0L	4.8	45	.70	25	1.4	60	W209905
W210025	.25	.45	3.6	.70L	1.5	24	.70	9.3	1.3	57	W210025
W210151	.20L	.44	.70	.12L	1.1	17	1.4	5.9	1.0	13	W210151
W210159	.39	.69	4.4	.52L	1.9	35	.80	9.2	1.7	11	W210159
W210160	.39	.39	3.8	.44L	1.0	20	.65	8.6	1.3	11	W210160
W210292	.08	.27	1.5	.23L	.89	19	.30	6.9	.8	26	W210292
W210432	.31	.21	2.5	.72L	1.3	27	.80	5.7	1.0	20	W210432
W210433	.20L	.20	.50	.20L	.57	8.4	2.9	6.6	.7	9.2	W210433
W210503	.22	.22	2.5	.25L	1.1	14	.60	6.5	1.1	7.0	W210503
W211194	.17	.41	2.1	2.9	1.4	23	.40	13	1.1	13	W211194
W211624	.54	.51	5.9	.71L	2.0	25	1.5	12	1.7	14	W211624
W213950	.09L	.23	.50	.21L	.38	6.4	2.8	7.4	.9	7.4	W213950
W213951	.20L	.18	.30	.17L	.35L	3.8	2.5	6.1	.6	4.2	W213951
W214266	.20	.48	3.7	2.9	3.6	39	1.2	8.6	1.4	12	W214266
W215418	.20L	.22	1.3	.37L	.32L	15	1.0	6.5	.7	9.7	W215418
W215546	.40	.37	3.7	.61L	2.0	18	1.1	5.9	1.3	21	W215546
W215547	.18	.43	2.2	.64L	1.6	28	1.3	9.6	1.5	8.1	W215547
W215548	.09L	.52	.80	.15L	.86	13	1.8	6.4	1.3	19	W215548
W215549	.33	.37	3.6	.87L	7.0	40	.90	7.9	1.3	12	W215549

Table 4.--Major-, Minor-, and Trace-Element Concentrations of 41 Bituminous Coal Samples from the Licking River District, Eastern Kentucky Reported on a Whole-Coal Basis--Continued.

SAMPLE NUMBER	ZR-S PPM
W209903	13
W209904	41
W209905	81
W210025	28
W210151	3.8
W210159	18
W210160	33
W210292	10
W210432	25
W210433	16
W210503	23
W211194	25
W211624	71
W213950	6.0
W213951	3.5
W214266	17
W215418	15
W215546	54
W215547	19
W215548	6.1
W215549	26

APPENDIX III:
PETROGRAPHIC ANALYSES

Maceral Composition and Vitrinite Reflectance
of Licking River District Coals

VIT - Vitrinite
PVT - Pseudovitrinite
FUS - Fusinite
SFS - Semifusinite
MIC - Micrinite
MAC - Macrinite
EX - Exinite
RES - Resinite
Rmax - Vitrinite maximum reflectance (Oil immersion: 546 nm)
S/D - Standard deviation
Rmn - Vitrinite mean relfectance (Oil immersion: 546 nm)

USGS# W-	KCER#	VIT	PVT	FUS	SFS	MIC	MAC	EX	RES	Rmax	S/D	Rmn	S/D
203632	2060	48.9	7.2	3.4	8.4	16.3	1.6	12.0	2.2	.65	.04	.61	.05
203633	2059	54.8	15.1	2.8	4.0	11.9	1.3	9.0	1.1	.79	.03	.74	.06
207115	2013	59.7	11.4	10.0	3.7	4.8	.6	9.1	.7	.61	.04	.57	.04
209662	2014	66.7	9.7	5.2	6.1	5.1	.2	6.5	.5	.71	.03	.66	.05
209663	2015	60.9	8.1	6.1	8.2	5.3	.6	10.3	.5	.67	.04	.62	.05
209664	2016	65.3	5.1	7.5	6.7	2.9	.2	10.9	1.4	.73	.03	.69	.05
209665	2017	68.9	6.2	4.6	6.5	3.3	.3	9.2	1.0	.73	.04	.67	.05
209666	2019	62.6	8.2	7.4	7.0	3.7	.3	10.1	.7	.71	.04	.66	.05
209850	2020	59.5	4.4	7.2	12.5	6.7	.1	8.5	1.1	.75	.05	.70	.06
209853	2021	46.0	3.3	10.8	18.0	8.2	.7	11.1	1.9	.71	.04	.66	.05
209870	2022	63.7	2.0	5.5	4.3	14.0		8.6	2.0	.67	.03	.64	.02
209871	2023	79.2	3.2	4.0	2.5	5.6		4.8	.7	.63	.04	.60	.05
209872	2024	67.4	4.6	7.4	5.0	8.1	.1	5.6	1.8	.69	.04	.64	.05
209873	2025	68.7	6.5	8.6	7.0	3.3	.9	3.9	1.1	.73	.05	.67	.06
209894	2029	74.5	5.8	8.2	2.8	1.6	.2	5.6	1.3	.67	.03	.63	.04
209898	2032	73.9	9.0	7.2	4.2	2.5	.1	2.7	.4	.71	.03	.66	.05
209899	2033	47.8	6.4	19.3	9.7	6.6	1.8	6.9	1.6	.68	.03	.63	.05
209900	2034	45.0	12.8	6.3	11.6	10.3	.7	10.0	3.3	.63	.03	.59	.05
209901	2035	73.6	8.7	4.6	3.7	3.5	.1	5.3	.5	.61	.04	.57	.04
209902	2018	48.2	5.4	8.3	12.9	8.3	.8	14.8	1.3	.67	.04	.62	.05
209903	2026	67.3	4.9	14.2	4.6	1.4	.2	7.1	.3	.64	.03	.59	.04
209904	2027	49.8	3.8	11.8	15.6	7.3	.4	10.5	.9	.64	.03	.60	.04
209905	2028	47.5	10.5	14.9	4.2	5.7	1.8	14.9	.5	.63	.03	.58	.05
210025	2036	78.6	3.6	6.5	5.8	2.4	.2	2.8	.2	.57	.03	.52	.04
210151	2037	85.0	4.6	1.8	2.7	2.6		3.2	.1	.60	.03	.55	.05
210159	2038	63.8	6.4	7.6	7.2	5.0	.4	8.6	1.1	.69	.05	.64	.06
210160	4142	59.2	6.9	8.2	6.3	7.4	.8	9.0	2.2	.74	.03	.68	.04
210292	2030	62.2	7.6	11.2	4.0	4.4	.6	9.2	.8	.69	.04	.64	.05
210432	2039	62.6	11.3	5.1	2.1	10.7	1.4	6.2	.6	.62	.03	.57	.07
210433	2040	66.1	10.9	5.5	4.0	6.1	.4	6.0	1.0	.64	.01	.60	.07
210503	2041	61.2	3.7	6.3	11.0	5.0	.6	11.4	.8	.75	.04	.71	.05
211194	2042	62.5	5.4	5.2	3.8	14.3		7.4	1.4	.67	.05	.62	.05
211624	2049	52.4	6.1	6.7	16.8	4.4	.2	12.8	.6	.75	.05	.71	.06
213950	2051	71.1	12.8	4.5	1.9	3.2	.3	5.1	1.1	.68	.02	.64	.04
213951	2052	65.0	6.7	14.7	3.2	4.0		6.0	.4	.59	.03	.56	.04

USGS# W-	KCER#	VIT	PVT	FUS	SFS	MIC	MAC	EX	RES	Rmax	S/D	Rmn	S/D
214266	2053	67.0	6.8	5.2	4.9	3.6	.2	10.9	1.4	.76	.04	.72	.05
215418	2054	82.6	5.1	1.9	3.2	2.4		4.1	.7	.63	.03	.58	.04
215546	2055	58.7	5.0	4.1	13.0	6.0	.2	10.9	2.1	.76	.03	.72	.05
215547	2056	59.4	5.9	6.3	11.6	4.1	.1	10.0	2.6	.72	.03	.68	.05
215548	2057	59.5	8.7	6.0	6.1	4.9	.2	10.7	3.9	.77	.02	.73	.05
215549	2058	52.0	7.1	2.5	6.6	12.2	1.7	14.9	3.0	.67	.03	.63	.04

INDEX OF COAL SAMPLES BY COUNTY, SORTED BY QUADRANGLE

COUNTY	7 1/2' QUADRANGLE	COAL NAME USED ON GQ	USGS ID NUMBER
Elliott	Isonville	Sebastian	W207115
Elliott	Isonville	Mudseam	W209894
Elliott	Isonville	Mudseam	W210292
Elliott	Isonville	Mudseam	W211194
Magoffin	David	Hazard	W209853
Magoffin	David	Upper Broas	W210503
Magoffin	Guage	Skyline	W210159
Magoffin	Ivyton	Broas	W209662
Magoffin	Ivyton	Broas	W209663
Magoffin	Ivyton	U Peach Orchard	W209664
Magoffin	Ivyton	U Peach Orchard	W209665
Magoffin	Ivyton	L Peach Orchard	W209666
Magoffin	Ivyton	Fire Clay	W209850
Magoffin	Ivyton	U Peach Orchard	W209902
Magoffin	Salyersville South	Peach Orchard	W209898
Magoffin	Salyersville South	Peach Orchard	W209899
Magoffin	Salyersville South	Peach Orchard	W209900
Magoffin	Seitz	Peach Orchard	W211624
Magoffin	Tiptop	Skyline	W210160
Magoffin	Tiptop	Peach Orchard	W215546
Magoffin	Tiptop	Peach Orchard	W215547
Magoffin	Tiptop	Peach Orchard	W215548
Magoffin	Tiptop	Peach Orchard	W215549
Morgan	Cannel City	Cannel City	W210432
Morgan	Cannel City	Grassy	W213950
Morgan	Cannel City	Cannel City	W213951
Morgan	Isonville	Mudseam	W209870
Morgan	Isonville	Mudseam	W209871
Morgan	Isonville	Sebastian	W209872
Morgan	Isonville	Laurel	W209873
Morgan	Isonville	Laurel	W210025
Morgan	Redbush	Van Lear	W203632
Morgan	Redbush	Van Lear	W203633
Morgan	White Oak	Prater	W209903
Morgan	White Oak	Prater	W209904
Morgan	White Oak	Peach Orchard	W209905
Wolfe	Campton	Grassy	W209901
Wolfe	Campton	Zachariah	W215418
Wolfe	Cannel City	Little Caney	W210433
Wolfe	Landsaw	Vires	W214266
Wolfe	Zachariah	Zachariah	W210151

INDEX OF COAL SAMPLES BY BED NAME, WITH SAMPLED INTERVAL AND SAMPLING REGIME

COAL NAME USED ON GQ	INTERVAL SAMPLED	SAMPLING REGIME	USGS ID NUMBER
Broas	bottom split	Swanson & Huffman	W209663
Broas	top split	Holmes	W209662
Cannel City	full thickness	Holmes	W210432
Cannel City	full thickness	Holmes	W213951
Fire Clay	full thickness	TK partings included	W209850
Grassy	full thickness	Holmes	W209901
Grassy	full thickness	Holmes	W213950
Hazard	full thickness	Holmes	W209853
Laurel	full thickness	Holmes	W209873
Laurel	rider	Holmes	W210025
Little Caney	full thickness	Holmes	W210433
L Peach Orchard	bottom split	Holmes	W209666
Mudseam	bottom bench	Holmes	W209870
Mudseam	bottom split	Swanson & Huffman	W210292
Mudseam	full thickness	Holmes	W211194
Mudseam	middle split	Holmes	W209894
Mudseam	top bench	Holmes	W209871
Peach Orchard	2d split f bot	Holmes	W215547
Peach Orchard	3d split f bot	Holmes	W215548
Peach Orchard	4th split f bot	Holmes	W215549
Peach Orchard	bottom split	Holmes	W209898
Peach Orchard	bottom split	Holmes	W209905
Peach Orchard	bottom split	Holmes	W211624
Peach Orchard	bottom split	Holmes	W215546
Peach Orchard	rider	Holmes	W209900
Peach Orchard	top split	Holmes	W209899
Prater	bottom split	Holmes	W209903
Prater	top split	Holmes	W209904
Sebastian	full thickness	Swanson & Huffman	W207115
Sebastian	top split	Holmes	W209872
Skyline	bottom split	Holmes	W210159
Skyline	middle split	Holmes	W210160
U Peach Orchard	bottom bench	Holmes	W209664
U Peach Orchard	middle bench	Holmes	W209665
U Peach Orchard	top bench	Holmes	W209902
Upper Broas	full thickness	Holmes	W210503
Van Lear	full thickness	unknown	W203632
Van Lear	full thickness	unknown	W203633
Vires	full thickness	Holmes	W214266
Zachariah	full thickness	Holmes	W210151
Zachariah	full thickness	Holmes	W215418